Execution Version

Central 70

Project Agreement
for the Central 70 Project

COLORADO BRIDGE ENTERPRISE,
HIGH PERFORMANCE TRANSPORTATION ENTERPRISE,
and
KIEWIT MERIDIAM PARTNERS LLC

Dated November 21, 2017

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This Project Agreement (this "Agreement") is made, entered into and effective as of the date it is approved and signed by the Colorado State Controller or its designee below (the "Agreement Date") among:

(1) Colorado High Performance Transportation Enterprise ("HPTE"), a government-owned business within and a division of the Colorado Department of Transportation ("CDOT");

(2) Colorado Bridge Enterprise, a government-owned business within CDOT ("BE" and, together with HPTE, each individually an "Enterprise" and, together, the "Enterprises"); and

(3) Kiewit Meridiam Partners LLC, a limited liability company formed under the laws of the State of Delaware ("Developer").

RECITALS

Whereas:

(A) CDOT has determined that the deteriorating condition and inadequate capacity of the I-70 East corridor requires a comprehensive transportation solution to resolve such challenges and to address other stakeholder and community concerns.

(B) Based on a review process conducted in accordance with the National Environmental Policy Act of 1969 ("NEPA"), CDOT identified a preferred alternative, the Preferred Alternative, to address these challenges and concerns.

(C) HPTE was created to pursue innovative means of more efficiently financing important surface transportation projects to improve the safety, capacity, and accessibility of the surface transportation system in the State, which means include public-private partnerships, user fee-based project financing, and availability payment and design-build contracting.

(D) BE was created for the purpose of financing, repairing, reconstructing, and replacing designated bridges that have been identified by CDOT as being structurally deficient or functionally obsolete.

(E) Pursuant to the State's Funding Advancements for Surface Transportation and Economic Recovery legislation, C.R.S. §§ 43-4-801, *et seq.*, the Enterprises were created as government-owned businesses within CDOT, each with certain limited statutory powers and duties necessary to accomplish their respective business purposes.

(F) Pursuant to Resolution #TC-15-2-5 approved February 19, 2015 by the State's Transportation Commission (the "Transportation Commission"), the Transportation Commission delegated to the Enterprises the responsibility for procurement of the design, construction, financing, operation and maintenance of a portion of the I-70 East corridor in Greater Denver (such portion, the "Project"), the scope of which Project is reflected by the scope of the Work required to be performed by Developer pursuant to this Agreement.

(G) The design, construction, financing, operation and maintenance method of procurement for the Project is intended to reduce overall Project cost and maximize the improvements that can be constructed, in part, by requiring private parties to assume and manage certain risks associated with the Project, including risks related to utilities, railroads, environmental conditions and financial and market conditions.

(H) On March 25, 2015, the Enterprises issued a Request for Qualifications for the Project, as subsequently amended on May 29, 2015.

(I) On June 22, 2015, the Enterprises received five responsive statement of qualification submittals from potential project developer groups, and then shortlisted four such groups on July 24, 2015 (each a "Proposer" and, collectively, the "Proposers") for purposes of proceeding to the next stage in the procurement process for the Project.

(J) Subsequently, the Enterprises issued to the Proposers for their review and comment a draft Request for Proposals ("RFP"), which included the Instructions to Proposers ("ITP"), first issued on September 15, 2015, and a draft of this Agreement, first issued on September 29, 2015. The Enterprises subsequently issued a number of addenda to the draft RFP, pursuant to the procedures set out in the ITP. On March 6, 2017 the Enterprises issued the final RFP, which was subsequently amended by addenda issued on April 25, 2017, May 25, 2017 and July 22, 2017.

(K) On January 15, 2016, the Federal Highway Administration (the "FHWA") issued the Final Environmental Impact Statement ("FEIS"). On January 19, 2017 the FHWA issued the Record of Decision (the "ROD") for Phase 1 of the Partial Cover Lowered Alternative, which is also known as the Central 70 Project. The ROD was published in the Federal Register (Vol. 82, No. 27) on February 10, 2017.

(L) On June 1, 2017 and August 1, 2017, the Enterprises received, respectively, the Proposers' technical and financial proposals in response to the RFP.

(M) On August 24, 2017, the Enterprises issued a notice identifying Kiewit Meridiam Partners as the successful Proposer (the "Preferred Proposer") to which the Project was awarded, subject to satisfaction of certain conditions precedent under the ITP to execution of this Agreement by Developer.

(N) As of the Agreement Date, the Equity Members of the Preferred Proposer, which as of such date are Meridiam I-70 East CO, LLC (as holder of a 60% direct membership interest) and Kiewit C70 Investors, LLC (as holder of a direct 40% membership interest), have formed Developer for purposes of executing this Agreement with the Enterprises, and have otherwise satisfied the conditions precedent under the ITP to execution of this Agreement.

(O) This Agreement and the further agreements referred to herein set out or, as applicable, will set out the terms and conditions pursuant to which Developer will implement the Project and perform the Work in consideration for the payments to be made by the Enterprises to Developer under this Agreement.

Now, therefore, in consideration of their mutual undertakings and agreements hereunder, and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the Parties undertake and agree as follows:

PART A: DEFINITIONS AND ABBREVIATIONS; INTERPRETATION; PROJECT INFORMATION

1. DEFINITIONS AND ABBREVIATIONS

Except as otherwise specified herein or as the context may otherwise require:

a. terms set out in Part A of Annex A (*Definitions and Abbreviations*) have the respective meanings set out therein for all purposes of this Agreement;

b. terms defined in either the CDOT Standard Specifications or the Standard Special Provisions have the respective meanings set out in the CDOT Standard Specifications and the Standard Special Provisions for purposes of the Construction Standards, provided that, if any term used in any Construction Standard is defined in both:

i. Part A of Annex A (*Definitions and Abbreviations*); and

ii. either the CDOT Standard Specifications or the Standard Special Provisions,

then such term shall have the meaning set out in Part A of Annex A (*Definitions and Abbreviations*); and

c. abbreviations set out in Part B of Annex A (*Definitions and Abbreviations*) are provided as references for purposes of the Technical Requirements, Table 6A.1 and Table 6A.2 only.

2. INTERPRETATION OF THIS AGREEMENT

2.1. Interpretation of Certain Terms, Phrases and Language

2.1.1. Headings and other internal references

a. Headings are inserted for convenience only and shall not affect interpretation of this Agreement.

b. Except as the context may otherwise provide, the words "herein", "hereof" and "hereunder", and words of similar import, shall be construed to refer to this Agreement in its entirety and not to any particular provision of it.

c. Except as otherwise expressly provided or as the context may otherwise provide, a reference to any Section within this Agreement (including in Part A of Annex A (*Definitions and Abbreviations*) and the Schedules) is a reference to such Section of this Agreement (excluding the Schedules).

d. Any reference to "Section X of the Project Agreement" (where "X" is a number) in any Schedule is a reference to the corresponding numbered Section in this Agreement (including Annex A (*Definitions and Abbreviations*), but excluding the Schedules).

2.1.2. Common terms and references

a. The singular includes the plural and vice versa.

b. Words preceding "include", "includes", "including" and "included" shall be construed without limitation by the words that follow.

c. The verb "will" has the same meaning and effect as the verb "shall."

d. The word "promptly" means as soon as reasonably practicable in light of then-prevailing circumstances.

2.1.3. References to agreements, documents, Law, Governmental Approvals and Permits

Except as otherwise expressly provided in this Agreement, and subject to Section 8.6.2 with respect to the Project Standards, a reference:

a. to an agreement or other document shall be construed to be a reference to such agreement or other document (including any schedules, annexes or exhibits thereto) as it may be amended, modified or supplemented from time to time pursuant to its terms; and

b. to any Law, Governmental Approval or Permit shall be construed as a reference to such Law, Governmental Approval or Permit as amended, replaced, consolidated or re-enacted (as applicable) from time to time.

2.1.4. References to Persons

Except as otherwise expressly provided in this Agreement:

a. a reference to a Person includes such Person's permitted successors, assigns and transferees;

b. the feminine includes the masculine and vice-versa; and

c. the words "they", "them", "themselves" and "their" when used to refer to a single Person or a grammatically singular antecedent shall be construed to mean an individual of unknown gender or whose gender is irrelevant.

2.1.5. Professional language and terms of art

Except as otherwise expressly provided in this Agreement:

a. words and phrases not otherwise defined herein:

i. that have well-known technical, insurance or construction industry meanings shall be construed pursuant to such recognized meanings; and

ii. of an accounting or financial nature shall be construed pursuant to GAAP,

in each case taking into account the context in which such words and phrases are used;

b. all statements of, or references to, dollar amounts or money, including references to "$" and "dollars", are to the lawful currency of the United States of America;

c. all references to "digital" or "electronic" media or communications shall include all technology or services having electrical, digital, magnetic, wireless, optical, electromagnetic or similar capabilities that are used to facilitate the storage or dissemination of data and information as of the Setting Date, and all other successor forms of technology that serve the same or equivalent purposes which come into existence or widespread use after the Setting Date; and

d. all references to reimbursement of another Person's "cost and expense" or "costs and expenses" shall be deemed to be references to reimbursement of all relevant third-party fees, costs and expenses incurred by such Person, including for those of external legal counsel and other external advisors.

2.1.6. Deadlines occurring on Calendar Days

Whenever this Agreement requires either Party (including CDOT acting as the Enterprises' designee pursuant to Section 18.1.2) to make any payment, or provide or deliver any Acceptance, Approval, consent, approval or like assent, notice, Deliverable, comment or any information or material, or otherwise complete any action or performance, in each case on or no later than a date that is a Calendar Day that is not also a Working Day, then such deadline shall automatically be extended to the next Working Day to occur after such Calendar Day.

2.2. Terminology for Agreements and Assents

2.2.1. Agreements and determinations

Where this Agreement provides that a matter shall be "Agreed or Determined", such reference shall mean either that:

a. the Parties have agreed to the matter in writing; or

b. that the matter has been finally determined pursuant to the Dispute Resolution Procedure.

2.2.2. Consents, approvals and like assents

Except as otherwise expressly provided in this Agreement, where this Agreement provides that any consent, approval or like assent:

a. shall not be "unreasonably withheld" by a Person, then it shall not be unreasonably withheld, delayed or made subject to the imposition of unreasonable conditions by such Person, and "unreasonably withhold" shall be similarly construed; and

b. is to be made or given in the "discretion" of a Person, it shall be made or given only in the sole and absolute discretion of such Person (which discretion includes the ability to refrain from giving, or to impose conditions on, such consent, approval or like assent), which discretionary decision regarding any consent, approval or like assent shall be final and binding and not subject to the Dispute Resolution Procedure other than with respect to:

i. a good faith dispute concerning whether the consent, approval or like assent was discretionary; or

ii. a breach of the implied covenant of good faith and fair dealing.

2.2.3. Acceptance, Approval and Information

Where this Agreement provides that any matter or information shall be submitted to the Enterprises (or to CDOT acting as their designee pursuant to Section 18.1.2) for their:

a. "Acceptance", then the Enterprises shall give their determination in writing and may not unreasonably withhold their Acceptance, after having a reasonably sufficient opportunity to review and comment on such submission, where the only bases for withholding such Acceptance shall be if the Enterprises determine, acting reasonably, that the subject-matter of such submission:

i. does not comply with this Agreement;

ii. does not comply with any Law, Governmental Approval or Permit;

iii. is not made pursuant to, or otherwise is not compliant with, Good Industry Practice;

iv. would give rise to a material risk to the health or safety of any person, the Environment or Improvements, the community or property; and/or

v. would have an adverse impact on:

A. the performance by Developer of its obligations under this Agreement;

B. the rights of the Enterprises under this Agreement; and/or

C. the Project,

(where any failure to respond within a time period expressly provided in this Agreement shall be deemed an Acceptance of such submission by the Enterprises);

b. "Approval", then the Enterprises shall give their determination in writing and may reject such submission in their discretion (where any failure to respond within a time period

expressly provided in this Agreement shall be deemed a rejection of such submission by the Enterprises); and

c. "Information", then no Acceptance, Approval, or other consent, approval or like assent, is required and the matter or information is being submitted for the Enterprises' information, review and comment only.

2.2.4. Default standards for consents, approvals and like assents

Where this Agreement requires one Party (including CDOT acting as the Enterprises' designee pursuant to Section 18.1.2) to provide a consent, approval or like assent to the other Party (excluding any waiver, for which purposes Section 43.3 shall apply, and any matter or submission expressly requiring Acceptance or Approval) and no express standard for such consent, approval or like assent is given, then such consent, approval or like assent shall be in writing and:

a. with respect to Developer, not be unreasonably withheld; and

b. with respect to the Enterprises, be in their discretion.

2.2.5. Limited Developer reliance

a. Developer may rely on Acceptances and Approvals, any other consent, approval or like assent, and any notice, from the Enterprises (including from CDOT acting as their designee pursuant to Section 18.1.2) only for the limited purpose of establishing that the Acceptance or Approval, or any other consent, approval or like assent, occurred, or any notice was given.

b. Except as otherwise expressly provided in this Agreement, no:

i. Acceptance or Approval, other consent, approval or like assent, or notice;

ii. comment, review, certification, concurrence, verification or oversight; or

iii. payment,

or the absence of any of the foregoing, shall in any case:

iv. constitute acceptance of materials, Work or any Element as satisfying the requirements of this Agreement;

v. relieve Developer from, or diminish Developer's liability for, the performance of its obligations under this Agreement;

vi. prevent the Enterprises from subsequently exercising their rights under this Agreement without being bound by the manner in which they previously exercised (or refrained from exercising) such rights; or

vii. constitute a waiver of any rights under this Agreement of any legal or equitable right of the Enterprises or of any other Person.

2.3. Indexation of Amounts

2.3.1. Contract Year Indexation

Subject to Section 2.3.2 and Section 4.2(d)(i) of Schedule 1 (*Financial Close*), where in this Agreement an amount is expressed to be "indexed", such expression means that the relevant amount will be changed on the first Calendar Day of each Contract Year (the "Relevant Contract Year") by applying the following formula:

$V_{new}=V_{old} \times (1 + (I_{new}-I_{old})/I_{old})$

Where:

a. V_{new} is the new amount for the Relevant Contract Year;

b. V_{old} is the amount for the Contract Year immediately preceding the Relevant Contract Year;

c. I_{new} is the value for CPI most recently published prior to the first Calendar Day of the Relevant Contract Year; and

d. I_{old} is the value for CPI most recently published prior to the first Calendar Day of the Contract Year immediately prior to the Relevant Contract Year, or, in the case of the first occasion on which this calculation is carried out, the value of CPI most recently published prior to July 1, 2017,

provided that, if I_{new} is less than or equal to I_{old}, then no calculation shall be carried out and V_{new} shall be deemed to be equal to V_{old}.

2.3.2. For purposes of:

a. the definitions of Base Benchmarked Insurance Cost and Proposal Insurance Cost in Part A of Annex A (*Definitions and Abbreviations*); and

b. Section 2.8.b of Schedule 13 (*Required Insurances*),

references to "Contract Years" in Section 2.3.1 shall be deemed to refer to the corresponding annual period referred to in such definitions or, as applicable, multi-year periods referred to in Section 2.8.b of Schedule 13 (*Required Insurances*).

2.4. Resolution of Conflicts Among, and Prioritization of, Terms

2.4.1. Integrated and binding agreement

a. Subject to Section 42.3, the Enterprises and Developer agree and expressly intend that this Agreement, which includes its Annex, Schedules and any valid amendments, constitutes a single, non-severable, integrated agreement whose terms are interdependent and non-divisible.

b. Subject to Sections 2.4.2 and 2.4.3 and the express terms of this Agreement, any term, condition, requirement, criteria or specification set out or referenced in any part of this Agreement is a binding contractual obligation.

2.4.2. Standards for resolving conflicts and inconsistencies

a. If there is any conflict, ambiguity or inconsistency between or among any provision(s) of (A) this Agreement (including Annex A (*Definitions and Abbreviations*), but excluding the Schedules) and/or (B) any provision(s) of the Schedules and/or (C) any provision(s) of the Project Standards, in each case that cannot be reconciled by reading all relevant provisions of this Agreement, the Schedules and/or the Project Standards as mutually explanatory of one another, then the order of precedence shall be as follows:

i. this Agreement (including Annex A (*Definitions and Abbreviations*), but excluding the Schedules) shall prevail over any of the Schedules and any of the Project Standards;

ii. Schedule 17 (*Environmental Requirements*) shall prevail over any other Schedule and any of the Project Standards;

iii. subject to Section 2.4.2.a.ii, Schedules 3 (*Commencement and Completion Mechanics*), 4 (*Payments*), 5 (*Milestone Payments*), 6 (*Performance Mechanism*), 8 (*Project Administration*), and 9 (*Submittals*) shall prevail equally over all remaining Schedules;

iv. Part B of Schedule 28 (*Proposal Extracts*) shall prevail over all other remaining Schedules; and

v. subject to Sections 2.4.2.a.ii, iii, and iv, all Schedules (including the Project Special Provisions) shall prevail equally over any of the Project Standards (excluding the Project Special Provisions);

provided that:

vi. if there is any conflict, ambiguity or inconsistency between or among any provision(s) of the Construction Standards, the order of precedence set out in Section 105.09 of the CDOT Standard Specifications shall apply;

vii. Changes made pursuant to any Change Order or Directive Letter and amendments made pursuant to Section 43.1 shall prevail over such portions of this Agreement that they modify or amend;

viii. in the event of any conflict, ambiguity or inconsistency between or among the provisions of this Agreement (including, for certainty, the Schedules) with an equal order of precedence, the most stringent requirement shall take precedence;

ix. notwithstanding anything to the contrary contained in this Agreement, in the event of any conflict, ambiguity or inconsistency between or among any applicable requirement under Law and any other requirement of this Agreement, the applicable requirement under Law shall take precedence;

x. except where expressly referred to in this Agreement, the Financial Model and its contents shall not be used to interpret this Agreement and shall not otherwise affect the meaning of this Agreement; and

xi. additional or supplemental requirements that Developer is required to comply with pursuant to this Agreement (including such requirements pursuant to any of the Project Standards) with a lower order of precedence relative to other parts of this Agreement (including, for certainty, the Schedules) as determined pursuant to this Section 2.4.2 shall be given effect except to the extent such requirements conflict or are inconsistent with, or otherwise create an ambiguity in relation to, the provisions contained in a part of this Agreement with a higher order of precedence.

b. [*Reserved.*]

2.4.3. Interpretation and resolution of conflicts

a. Each Party shall notify the other Party promptly after it identifies or becomes aware of any conflict, ambiguity or inconsistency:

i. of a type described in Section 2.4.2;

ii. between or among any Deliverable and the provisions of this Agreement and/or the Project Standards; or

iii. regarding the interpretation of any Deliverable,

and each Party agrees to not take advantage of any such conflict, ambiguity or inconsistency, or of any other error or omission in or to this Agreement. Furthermore, in the event of any such conflict, ambiguity or inconsistency, the Parties agree that the relevant terms of this Agreement shall not be construed against the Person that prepared them and the Parties waive any Law with contrary effect which would otherwise be applicable in connection with the construction and interpretation of this Agreement.

b. To the extent that the Parties disagree on the reconciliation of any conflict, ambiguity or inconsistency of a type described in Section 2.4.3.a.ii to the extent such relates to a

Technical Deliverable, the Enterprises may, in their discretion, notify Developer of their determination regarding such reconciliation, which determination shall be binding, unless such determination is Agreed or Determined to:

i. substantively amount to a unilateral amendment to this Agreement or to a Change not made pursuant to Section 14; or

ii. breach the implied covenant of good faith and fair dealing.

3. PROJECT INFORMATION, RELIANCE AND DILIGENCE

3.1. Limited Reliance on Project Information

Developer acknowledges and agrees that:

a. prior to the Final Project Information Date, the Reference Documents (including, for certainty, the Reference Design) and certain other documents, information, reports and materials (together, the "Project Information") were made available to the Preferred Proposer for information only as contemplated in Section 2.5.1 of Part C of the ITP;

b. prior to the Agreement Date, the Preferred Proposer, the Core Proposer Team Members and Developer each conducted their own due diligence on the accuracy, completeness, relevance, fitness for purpose and adequacy of the Project Information;

c. the Reference Documents have not been incorporated into this Agreement either as a result of being listed in Schedule 29 (*Reference Documents*) or as a result of being referenced in any provision of this Agreement that requires Developer to comply with a specific Reference Document (or part thereof); and

d. neither the Enterprises, nor any other Person that produced or provided any Project Information, gives or has given any representation, warranty, undertaking or guarantee as to the accuracy, completeness, relevance, fitness for purpose or adequacy of any Project Information, and as such:

i. Developer is not entitled to rely on any Project Information, except with respect to any Reference Document, to the extent such Reference Document is either expressly or implicitly and necessarily the basis for determining the occurrence of a Supervening Event or whether any risk, information, matter or thing was Known or Knowable; and

ii. subject to Section 3.4, neither the Enterprises, nor any other Person that produced or provided any Project Information, shall have any responsibility or liability to Developer or any other Developer-Related Entity in respect of, and Developer shall not be relieved of any obligation under this Agreement as a result of:

A. any lack of accuracy, utility, completeness, relevance, fitness for purpose or adequacy of any kind whatsoever of any such Project Information;

B. any interpretations of, or conclusions drawn from, any such Project Information;

C. any failure by the Enterprises, or by any other Person that produced or provided any such Project Information, to update such Project Information, the contents of which may reflect information available as of the date that such Project Information was prepared or as of such other date indicated therein;

D. any failure by the Enterprises or any other Person to reference or otherwise make available any materials, documents, drawings, plans or other information relating to the Project; or

E. any causes of action or claims of, or Losses whatsoever suffered by, Developer or any other Developer-Related Entity by reason of any use of, or any action or forbearance in reliance on, such Project Information.

3.2. Responsibility for Independent Diligence

3.2.1. Sufficient diligence

Subject to the terms of this Agreement, Developer is deemed to have satisfied itself as to:

a. the sufficiency and (as applicable) condition of the Right-of-Way, the ROD Construction Limits and the Project License, and of all other property, assets and rights that it is entitled to receive under this Agreement;

b. the nature and extent of the risks assumed by it under this Agreement;

c. the sufficiency of the Preferred Proposer's and the Developer-Related Entities' opportunities to conduct due diligence, including in relation to the condition of each ROW Parcel, on or prior to the Setting Date pursuant to Good Industry Practice; and

d. the precautions and times and methods of working necessary to prevent or, if it is not possible to prevent, to mitigate or reduce any nuisance or interference, whether public or private, being caused to any third parties through the performance of the Work.

3.2.2. No reliance on unincorporated statements or representations and warranties

Developer acknowledges and agrees that:

a. it has not entered into this Agreement on the basis of, and has not relied upon, any statement, representation or warranty or other provision (in each case whether oral or written, express or implied) made or agreed to by the Enterprises or by any other Person, or any of their agents or employees, except those expressly set out or repeated in this Agreement; and

b. the only remedies available in respect of any untrue statement, misrepresentation or breach of warranty made to Developer in this Agreement shall be any remedies expressly available under this Agreement.

3.3. Limitations on Site Condition Claims

3.3.1. General prohibition of Claims, subject to limited exceptions

Neither Developer nor any other Developer-Related Entity shall be entitled to make any Claim against any Person in relation to the condition of any ROW Parcel or any Additional ROW Parcel at the time such parcel first became subject to Developer's Possession or Developer first acquired any interest or right in respect of such parcel, except, with respect to Developer Claims only:

a. with respect to Claims against the Enterprises and CDOT, to the extent expressly provided for in this Agreement; and

b. with respect to Claims against any other Person:

i. to the extent that such Claims are against the relevant contractor pursuant to Colo. Rev. Stat. §§ 13-20-801 *et seq*. in relation to such contractor's construction of Structure No. E-17-VD (I-70 over Havana Street) or Structure No. E-17-VE (I-70 over UPRR spur track) (for purposes of this Section 3.3, any such Claim, a "Relevant Claim" and any such contractor, a "Relevant Contractor"), subject only to Developer providing five Working Days' prior notice to the Enterprises that it intends to make a Relevant Claim (or such longer period of notice as is reasonable in the circumstances in the event that Developer has made a request to the Enterprises pursuant to Section 3.3.2.c);

ii. to the extent that such Claims are with respect to:

A. any Unexpected Hazardous Substances (where, for purposes of this Section 3.3.1.b.ii.A, the exclusions in paragraphs b., c., d., e., f. and g.iii. of the definition thereof in Part A of Annex A (*Definitions and Abbreviations*) shall not apply); or

B. any Unexpected Groundwater Contamination Conditions;

subject to the prior written consent of the Enterprises (such consent not to be unreasonably withheld); and

iii. otherwise, subject to the prior Approval of the Enterprises.

3.3.2. Assignment of and assistance with certain Claims

In connection with the assertion or potential assertion of a Relevant Claim by Developer:

a. as of the Agreement Date, the Enterprises shall have procured the assignment by CDOT to the Enterprises of any right of CDOT to assert a Relevant Claim against any Relevant Contractor;

b. the Enterprises hereby assign to Developer:

i. the rights of CDOT that were previously assigned to the Enterprises as referenced in Section 3.3.1.b.i; and

ii. any other right of the Enterprises to assert a Relevant Claim against any Relevant Contractor; and

c. the Enterprises shall, upon the reasonable request of Developer, use (and shall procure that CDOT shall use) Reasonable Efforts to cooperate with Developer in the assertion of any Relevant Claim against a Relevant Contractor, including by making available any relevant documents or materials in the Enterprises' or CDOT's possession.

3.4. Residual Enterprise Liability

Nothing in this Section 3 shall exclude any liability which the Enterprises would otherwise have to Developer:

a. in respect of any statements, representations or warranties made fraudulently, recklessly or in bad faith or constituting willful misconduct or gross negligence; or

b. to the extent expressly provided for in this Agreement.

PART B: EFFECTIVENESS AND TERM; REPRESENTATIONS AND WARRANTIES; FINANCIAL CLOSE; GRANT OF RIGHTS

4. EFFECTIVENESS AND TERM

4.1. Effectiveness

This Agreement (including Annex A (*Definitions and Abbreviations*) and the Schedules) shall come into effect on and from the Agreement Date.

4.2. Term

The "Term" shall commence on the Agreement Date and end on the earliest to occur of:

a. the Expiry Date; and

b. the Termination Date.

5. REPRESENTATIONS AND WARRANTIES

5.1. Representations and Warranties

5.1.1. Developer hereby represents and warrants to the Enterprises that each representation and warranty set out in Part A of Schedule 2 (*Representations and Warranties*) is true and correct as of the Agreement Date and, as applicable, is true and correct as of the effective date of the relevant Principal Subcontract.

5.1.2. Each Enterprise hereby represents and warrants to Developer that each representation and warranty made by it and set out in Part B of Schedule 2 (*Representations and Warranties*) is true and correct as of the Agreement Date.

5.2. Mutual Reliance

Developer and each Enterprise acknowledge that, respectively, the Enterprises and Developer enter into this Agreement in reliance on the representations and warranties made pursuant to Section 5.1.

5.3. Notice of Untrue, Incorrect or Misleading Representations and Warranties

Notwithstanding that the representations and warranties made by the Parties pursuant to Section 5.1 are made and, pursuant to Sections 2.2(b) and 2.3(a) of Schedule 1 (*Financial Close*), repeated, only at particular times:

a. Developer shall promptly inform the Enterprises after it becomes aware that any of its representations and warranties either was false, misleading or inaccurate in any material respect when made (or repeated) or omitted material information when made (or repeated); and

b. each Enterprise shall promptly inform Developer after it becomes aware that any of the representations and warranties made by it either was false, misleading or inaccurate in any material respect when made (or repeated) or omitted material information when made (or repeated).

5.4. Special Remedies for Mutual Breach of Warranty

If any circumstance or event exists or occurs that constitutes or results in concurrent breaches of any of the parallel representations and warranties made pursuant to Section 5.1, or thereafter repeated pursuant to Schedule 1 (*Financial Close*), by Developer and one or both Enterprises, but which breaches do not also constitute or result in any other breach or default by either Party, including, subject to the passage of time and giving of notice, a Developer Default or an Enterprise Default, then:

a. such breaches shall not result in a Supervening Event or form the basis for a damages claim by either Party against the other; and

b. each Party's only remedy shall be to:

i. take action as permitted under this Agreement to rectify or mitigate the effects of such circumstance or event;

ii. if applicable, exercise its rights to pursue severance and/or substitution of any invalid clause, condition, term, provision, section, subsection or part of this Agreement pursuant to Section 42.3;

iii. if applicable, pursue a Termination by Court Ruling; and/or

iv. exercise its rights pursuant to Section 43.3.

5.5. Survival of Representations and Warranties

Pursuant to Section 41, each Party's liability with respect to its representations and warranties made pursuant to Section 5.1, or thereafter repeated pursuant to this Agreement, shall survive the end of the Term.

6. FINANCIAL CLOSE

6.1. Financial Close Process

The Parties agree to comply with their respective obligations with respect to the achievement of Financial Close pursuant to Schedule 1 (*Financial Close*).

6.2. Achievement of, or Failure to Achieve, Financial Close

6.2.1. Financial Close shall occur subject to, and in accordance with, Sections 2 and 3 of Schedule 1 (*Financial Close*).

6.2.2. A failure to achieve Financial Close by the Financial Close Deadline shall have the effects set out in, and may result in termination of this Agreement pursuant to, Section 5 of Schedule 1 (*Financial Close*).

7. GRANT OF RIGHTS AND PROJECT LICENSE

7.1. Grant of Right to Develop Project

Subject to the terms and conditions of this Agreement:

a. the Enterprises hereby grant to Developer the exclusive right to design, construct, finance, operate and maintain the Project in each case pursuant to this Agreement; and

b. Developer accepts such right and acknowledges its obligations under this Agreement,

in each case during the Term.

7.2. Developer's Project License

7.2.1. Grant of Project License

a. Subject to the terms and conditions of this Agreement:

i. the Enterprises grant to Developer a license (the "Project License") over, under, upon and in the Right-of-Way, and any Additional Right-of-Way, for the sole purpose of exercising its rights and performing its obligations under this Agreement pursuant to the terms hereof; and

ii. Developer acknowledges and accepts such Project License.

b. Without limiting Developer's conditional, limited rights to obtain early access to and use of (but, for certainty, not Possession of) ROW Parcels pursuant to Section 1.2 of Schedule 18 (*Right-of-Way*), the Enterprises shall deliver, and Developer shall be entitled to have, Possession of:

i. each ROW Parcel on and from the Possession Date specified in the Notice of Possession with respect to such ROW Parcel until such ROW Parcel's Project License End Date; and

ii. any Additional ROW Parcel on and from the Possession Date specified in the Notice of Possession with respect to such Additional ROW Parcel until such Additional ROW Parcel's Project License End Date,

without prejudice to Developer's rights arising as a result of the occurrence of any Compensation Event as described in paragraph b. of the definition thereof in Part A of Annex A (*Definitions and Abbreviations*) and, for certainty, subject to such rights and restrictions of access and use of certain third parties that fall within the definition of Possession in Part A of Annex A (*Definitions and Abbreviations*) from time to time during the Term.

c. The Project License shall automatically be revoked upon the occurrence of the end of the Term.

d. The Enterprises may, in their discretion, by not less than 365 Calendar Days' notice to Developer, terminate the Project License with respect to the ROW Parcels (or any part thereof) on which the Maintenance Yard is located in the event that the Enterprises or CDOT require the use of such ROW Parcels (or part thereof) in connection with the development of the ultimate planned-for improvements to the I-70 East corridor as described in the FEIS, provided that:

i. any such termination shall not be effective prior to the Final Acceptance Date;

ii. prior to exercising such termination rights, the Enterprises shall consult with Developer to consider the extent to which there may be alternative solutions that:

A. do not require the termination of the Project License with respect to any or all such ROW Parcels (or any part thereof) in connection with such development; and

B. are acceptable to the Enterprises in their discretion.

Following any such termination pursuant to this Section 7.2.1.d, Developer shall, without limiting its other obligations under this Agreement, cooperate and coordinate with the transfer of such ROW Parcels (or any part thereof) to the Enterprises, CDOT or any other Person designated by the Enterprises. Developer shall not be entitled to any compensation, extension of time and/or relief with respect to any exercise by the Enterprises of their rights pursuant to this Section 7.2.1.d.

7.2.2. Sublicensing

Developer shall have the right to issue sub-licenses under the Project License to Subcontractors as necessary to carry out Developer's obligations under this Agreement.

7.2.3. Limitations and qualifications on the grant of rights and Project License

a. The Project License is personal property, and not an interest in real property, and shall not be recorded in the City of Denver's Clerk and Recorder's Office or in any other county.

b. Developer shall not use any part of the Site, or exercise its rights with respect to the Project License, in either case, for any purpose other than carrying out its obligations under this Agreement.

c. Developer's interest in the Right-of-Way, and any Additional Right-of-Way, is limited by the Project License and the other terms and conditions of this Agreement. Developer is not and shall not be, and shall not be treated as or be deemed to be, the legal or

equitable owner of the Right-of-Way, or any Additional Right-of-Way, in whole or in part, for any purpose.

d. This Agreement does not, and shall in no way be deemed to, constitute a lease (regardless of the characterization of such lease, including as an operating lease or a financing lease) to Developer or, except as expressly provided in Section 7.1, a grant (regardless of the characterization of such grant, including by way of easement, purchase option, conveyance, lien or mortgage), in each case, of any right, title, interest or estate, including any fee simple, leasehold estate, easement or property interest of any kind, in or to the Right-of-Way, any Additional Right-of-Way, the Project or of any Assets incorporated into, or appurtenant to, the Project.

e. Without limiting its rights under this Agreement arising as a result of the occurrence of any Compensation Event as described in paragraph b. of the definition thereof in Part A of Annex A (*Definitions and Abbreviations*), Developer acknowledges and agrees that its Possession of each ROW Parcel and any Additional ROW Parcel pursuant to Section 7.2.1.b is subject to the rights and restrictions of access and use of certain third parties that fall within the definition of Possession in Part A of Annex A (*Definitions and Abbreviations*) from time to time during the Term. Developer shall reasonably facilitate access to and through the Site by all Persons with such rights of access and use, and shall not take any action (or refrain from taking any action) in a manner that is calculated or intended to directly or indirectly prejudice or frustrate such rights of access and use.

7.3. Ownership and Liability

7.3.1. Right-of-Way

All of the Right-of-Way, and any Additional Right-of-Way, shall be held or acquired, as applicable, in the name of CDOT (or in such other name(s) as the Enterprises may otherwise determine in their discretion). Subject to the terms of this Agreement, the Enterprises reserve to themselves and their designees, including CDOT, the rights of use, occupancy and, as applicable, ownership over, under, upon and in the Right-of-Way and any Additional Right-of-Way.

7.3.2. Developer's responsibilities

Following either Developer's Possession of any ROW Parcel or any Additional ROW Parcel pursuant to Section 7.2.1.b (and for such period of time as Developer is entitled to have Possession thereto pursuant to such Section), or Developer's acquisition of any interest or right with respect to any Temporary Property or Permit Area (and for such period of time as such interest or right is maintained), Developer shall (as among the Parties):

a. have sole responsibility for such part of the Site (and for all Elements located thereon), including risk of damage and loss; and

b. bear any costs and expenses incurred in relation to such part of the Site (and in relation to all Elements located thereon), including all fees, expenses and taxes associated with such part of the Site,

in each case subject to the express terms of this Agreement.

7.3.3. Transfer of Ownership

a. With respect to any part of any Element that is to be affixed to any ROW Parcel or any Additional ROW Parcel (or any infrastructure already affixed thereto) as part of the Project, ownership of and title to each such part shall automatically vest in CDOT (or, in the Enterprises' discretion, their designee) free from all Encumbrances, other than Permitted Encumbrances, immediately upon such part being affixed thereto.

b. Any Work Product, including all property interests therein, shall be considered "works made for hire" pursuant to Law and, accordingly, shall be the property of the Enterprises, excluding only:

i. the Financial Model;

ii. any Project Records that are exempt from disclosure in compliance with CORA and other Laws applicable to the disclosure of Public Records, but only to the extent identified in the disclosure protocol Accepted by the Enterprises pursuant to Section 20.1.2 as being excluded from the application of this Section 7.3.3.b; and

iii. any Proprietary Intellectual Property.

c. Notwithstanding Section 7.3.3.a:

i. the vesting of ownership of and title to any part of any Element pursuant to Section 7.3.3.a and any Work Product pursuant to Section 7.3.2.b shall not imply acceptance of such part of such Work Product by the Enterprises (or by such part's or such Work Product's current or future owner) as to the compliance of such part with the requirements set out in this Agreement, nor shall Developer be relieved of its obligation to comply with any of its obligations under this Agreement with respect to such Element or such Work Product, as applicable, the Work or otherwise; and

ii. subject to the terms of this Agreement, the risk of loss or damage to such part of any Element and any Work Product held by Developer shall remain with Developer pursuant to Section 7.3.2.

d. Developer shall not do any act or thing that will create any Encumbrance (other than with respect to any Element or other real property, a Permitted Encumbrance) against any Element (or part thereof), any Work Product or any part of the Right-of-Way or of any Additional Right-of-Way, and shall promptly remove any such Encumbrance (including such a Permitted Encumbrance that falls within paragraph b. of the definition thereof in Part A of Annex A (*Definitions and Abbreviations*), but excluding any other Permitted Encumbrances), unless such Encumbrance came into existence as a result of an act of or omission by the Enterprises or CDOT, or a Person claiming through any of them, which in turn was not caused by an act or omission of Developer or any other Developer-Related Entity.

PART C: OBLIGATIONS TO DESIGN, CONSTRUCT, OPERATE, MAINTAIN AND HANDBACK THE PROJECT

8. DEVELOPER'S PROJECT OBLIGATIONS

8.1. General Undertakings

8.1.1. Developer hereby undertakes to perform the Work pursuant to and in compliance with:

a. the terms, conditions and requirements of this Agreement, including each of the Schedules;

b. the Project Standards;

c. Law;

d. all Governmental Approvals and all Permits in effect from time to time; and

e. Good Industry Practice.

8.1.2. Furthermore, Developer hereby undertakes that it shall:

a. not adopt or, once adopted, change its legal form or name of organization without the Enterprises' prior consent, such consent:

i. in the Enterprises' discretion, if such change would adversely affect the Enterprises' rights, obligations or interests under this Agreement or with respect to the Project; and

ii. otherwise, not to be unreasonably withheld;

b. not carry out any business or other activities other than business and activities solely related to the performance of its obligations pursuant to this Agreement in relation to the Project;

c. not permit any other Person to carry out any business activities on the Site or in relation to the Project, except as expressly permitted by this Agreement;

d. not commit or otherwise facilitate, and not permit any other Developer-Related Entity to commit or otherwise facilitate, the commission of any Prohibited Acts;

e. maintain and, as applicable, comply with, and ensure that each Principal Subcontractor maintains and complies with, all licenses, certifications and accreditations and related standards, as well as all other required professional abilities, skills and capacity, in each case required to perform the Work; and

f. subject to any rights of Developer arising as a result of the occurrence of any Developer Change documented in a Change Order or any Supervening Event, bear all risk, including of delay and/or increased cost, resulting from or arising out of the use of the Reference Design or the I-70 Cover Plans or any differences between its design for any portion of the Project and the Reference Design or such plans.

8.1.3. Without limiting its other obligations under this Agreement, Developer shall use Reasonable Efforts to cooperate and coordinate with the Enterprises, CDOT and all other Governmental Authorities with jurisdiction in matters relating to the Work, including their review, inspection and oversight of the Project as contemplated herein, in accordance with any Law granting such jurisdiction or as contemplated by any of the Third Party Agreements.

8.2. Assumption of Risk and Responsibility

8.2.1. Except to the extent otherwise expressly provided for in this Agreement (including as the result of the occurrence of any Developer Change documented in a Change Order or Supervening Event), all risks, costs and expenses in relation to the performance by Developer of the Work are allocated to, and accepted by, Developer as its entire and exclusive responsibility.

8.2.2. As among the Parties, Developer shall be solely responsible for the selection, pricing and performance of all Subcontractors (of every tier) and all other Persons for whom or for which Developer is responsible by contract or pursuant to Law, and for the performance, acts, defaults, omissions, breaches and negligence of the same, as fully as if any such performance, acts, defaults, omissions, breaches or negligence were those of Developer.

8.2.3. In the event that the inclusion in this Agreement of any ATC (as defined in the ITP) that was included in the Preferred Proposer's Proposal was made subject to any express condition, as such conditions are set out, and defined as ATC Conditions, in Part B of Schedule 28 (*Proposal Extracts*), Developer shall be solely responsible for satisfying such condition. If any such condition is not satisfied, and without limiting the Enterprises' other rights hereunder, Developer shall comply with the requirements of this Agreement (unmodified by such ATC) without any resulting entitlement to an extension of time, relief and/or compensation.

8.3. Federal and State Requirements

8.3.1. Compliance with Federal requirements

a. Developer shall, and shall ensure that in respect of the Project and the Work each of its Subcontractors and each of their respective Subcontractors shall, comply with all Federal Law requirements applicable to transportation projects that receive Federal credit or funds, including the requirements set out in Schedule 15 (*Federal and State Requirements*).

b. In the event of any conflict between any applicable Federal Law requirement and the other requirements of this Agreement, Section 2.4.2.a.ix shall apply.

8.3.2. False or fraudulent statements and claims

a. Developer recognizes that the requirements of the Program Fraud Civil Remedies Act of 1986, 31 U.S.C. § 3801 *et seq*., and the US DOT regulations, "Program Fraud Civil Remedies," 49 CFR Part 31, apply to its actions under this Agreement.

b. Accordingly, by signing this Agreement, Developer certifies and affirms the truthfulness and accuracy of any claim, statement, submission or certification it has made pertaining to this Agreement and the Project.

c. Developer acknowledges that, if it makes a false, fictitious or fraudulent claim, statement, submission or certification, then, in addition to any other penalties that may be applicable, the Federal government reserves the right to impose the penalties of the Program Fraud Civil Remedies Act of 1986, 31 U.S.C. § 3801 *et seq*., on Developer to the extent the Federal government deems appropriate.

8.3.3. Federal status of Project

a. Developer acknowledges that:

i. the FHWA has designated the Project as a "Major Project" under 23 U.S.C. § 106, which designation, as applied to the Project by the FHWA (including pursuant to the FHWA's "Major Project Financial Plan Guidance" (December 2014)), requires:

A. submission by the Enterprises to, and approval by, FHWA of a project management plan; and

B. subject to Section 8.4.3.a, submission by Developer of:

I. promptly following Financial Close, an initial financial plan; and

II. during the Construction Period, annual updates to such financial plan,

in each case to, and for approval by, FHWA; and

C. submission by the Enterprises to, and approval by, FHWA of a supplement to each financial plan submitted by Developer pursuant to Section 8.3.3.a.i.B; and

ii. portions of the Project are and will be part of the National Highway System, as defined in 23 CFR § 470.

b. Accordingly:

i. to facilitate subsequent submission to, and approval by, FHWA pursuant to Section 8.3.3.a.i.B.I, no later than 30 Calendar Days after the Agreement Date Developer shall submit to FHWA, for initial FHWA review (but not approval), a draft initial financial plan as Approved by the Enterprises; and

ii. Developer acknowledges and agrees that the Enterprises may submit documents based on or including the Proposal and/or Project Records to the FHWA in order for the Enterprises to comply with the requirements of 23 U.S.C. § 106(h) as applied to the Project by FHWA, including as part of any submission made by the Enterprises to the FHWA as described in Sections 8.3.3.a.i.A and 8.3.3.a.i.C, and Developer shall also use Reasonable Efforts to cooperate with and assist the Enterprises in the Enterprises complying with such requirements as reasonably requested by the Enterprises from time to time.

8.3.4. Emergency Repair Work

a. As a condition to receiving payment of any Change in Costs for performing Emergency Repair Work as a result of the occurrence of any Compensation Event as described in paragraphs c., (with respect to relevant Public Safety Orders), d., e. and k. of the definition thereof in Part A of Annex A (*Definitions and Abbreviations*), Developer shall competitively bid and contract for such Emergency Repair Work as FHWA's or FEMA's or any other equivalent Governmental Authority's applicable regulations, policies or procedures may require in order for the Enterprises or CDOT to obtain reimbursement for eligible costs.

b. Developer shall:

i. ensure that any Emergency Repair Work is performed pursuant to the requirements of this Agreement, Law and FHWA's, FEMA's and any other equivalent Governmental Authority's applicable regulations, policies or procedures, including (as applicable) the FHWA's "Emergency Relief Manual"; and

ii. maintain estimates, cost records and supporting documentation pursuant to such applicable regulations, policies or procedures, and otherwise in form and substance as reasonably required by the Enterprises.

c. Without limiting Developer's obligations under Sections 8.3.4.a and 8.3.4.b, the Enterprises may, in their discretion, provide oversight of Emergency Repair Work as may be required by FHWA, FEMA or any other equivalent Governmental Authority, or by Law, to preserve eligibility for reimbursement of eligible costs.

8.3.5. Restrictions on communications with FHWA and US DOT

Developer shall only communicate with the FHWA and the US DOT in relation to the Project and the Work indirectly through the Enterprises, except for direct communications:

a. with respect to the TIFIA Financing;

b. as required by Law;

c. expressly permitted or required by this Agreement; or

d. made with the Enterprises' prior Approval,

in each of which cases Developer shall provide the Enterprises with regular and reasonably detailed written updates regarding such communications.

8.4. Governmental Approvals and Permits

8.4.1. Department Provided Approvals

The Department Provided Approvals were obtained prior to the Agreement Date by CDOT and, subject to Section 8.4.3.b, shall be maintained by the Enterprises, acting in coordination with CDOT, at their cost and expense (excluding any cost or expense borne by Developer pursuant to Section 8.4.3.b).

8.4.2. Developer's responsibility to obtain Governmental Approvals and Permits

a. Subject to Section 8.4.4.a, and without limiting its rights under this Agreement arising as a result of the occurrence of any Developer Change documented in a Change Order or any Supervening Event (including any such rights that relate to obtaining any new or amending any existing Governmental Approval or Permit as a result of any such Change Order or Supervening Event), Developer shall be responsible for obtaining all Governmental Approvals (other than the Department Provided Approvals) and all Permits, and for arranging any necessary amendments to any Governmental Approvals (including, pursuant to Section 8.4.3.b, Department Provided Approvals) and any Permits, in each case as necessary to perform its obligations hereunder at the time and in the manner when they fall due for performance.

b. Without limiting its obligations under Section 19.1, Developer shall deliver to the Enterprises copies of all Governmental Approvals and Permits for which it is responsible pursuant to Section 8.4.2.a (and copies of any modifications, renewals, extensions and waivers to or of any thereof) promptly following receipt by Developer of the same.

c. Developer's obligations under Section 8.4.2.a shall not be limited by any Law placing responsibility for the same upon either or both of the Enterprises, CDOT or another Person.

8.4.3. Submissions to the FHWA and involving Department Provided Approvals; process for obtaining and modifying Governmental Approvals

a. Prior to submitting an application for any Governmental Approval or Permit (or for any proposed termination, modification, renewal, extension or waiver of a Governmental Approval or Permit) or (with respect to FHWA only) any other Deliverable to:

i. the FHWA; or

ii. any Person with respect to all such submissions that involve a Department Provided Approval,

Developer shall first submit the same, together with any supporting environmental or other studies, analyses and data, to the Enterprises for Approval. Developer shall submit each other application for a Governmental Approval or Permit (or for any proposed termination, modification, renewal, extension or waiver of a Governmental Approval or

Permit) for, except as otherwise provided in this Agreement, Information to the Enterprises in accordance with Section 5(a) of Schedule 9 (*Submittals*).

b. As between the Enterprises and Developer, Developer shall perform all necessary actions and shall bear all risk of delay and/or all risk of cost and expense, in either case, associated with Governmental Approvals and with Permits, including:

i. without limiting the Enterprises', CDOT's and FHWA's rights to independently evaluate all environmental and other studies and documents and fulfil the other responsibilities assigned to them by 23 CFR Part 771, conducting all necessary environmental or other studies and preparing all necessary environmental or other documents in compliance with Law (provided that the Enterprises may, in their discretion, elect to conduct any such studies or to prepare any such documents at the Enterprises' cost and expense);

ii. obtaining and complying with all necessary new Governmental Approvals and Permits, or all necessary modifications, renewals and extensions of existing Governmental Approvals and Permits, or of pending applications for Governmental Approvals and Permits; and

iii. all risk and cost of litigation,

where such risk of delay and/or risk of cost and expense:

iv. either:

A. relates to:

I. a Governmental Approval that is not a Department Provided Approval; or

II. a Permit; or

B. results from:

I. Developer's use of the Reference Design or the I-70 Cover Plans (except to the extent that any such risk of delay and/or cost and expense relates solely to a Department Provided Approval);

II. any differences between Developer's design and the Reference Design or the I-70 Cover Plans

III. differences between the design, construction, operations and/or maintenance means and methods Developer chooses for any portion of the Project and those set out, referred to or contemplated in any Governmental Approval (including, for certainty, any Department Provided Approval) or Permit, or in the application for any Governmental Approval or Permit;

IV. the incorporation of any ATC (as defined in the ITP) into this Agreement;

V. the acquisition of any Additional ROW Parcel, Developer-risk Permit Area or Temporary Property Rights; and/or

VI. any breach of Law, Governmental Approval, Permit or this Agreement, or fraud, willful misconduct, criminal conduct, recklessness, bad faith or negligence by or of any Developer-Related Entity; and

v. does not otherwise result from the occurrence of any Supervening Event (including where such Supervening Event results in a requirement to obtain any new or amend any existing Governmental Approval or Permit) or to the extent otherwise agreed in any Change Order.

c. If Developer is unable to obtain, modify, renew or extend any Governmental Approval or Permit for which it is responsible pursuant to Section 8.4.2.a, then, without limiting its rights under this Agreement arising as a result of the occurrence of any Developer Change documented in a Change Order or any Supervening Event (including as a result of the Enterprises' breach of their obligations under Section 8.4.4.a, and including any such rights that relate to obtaining any new or amending any existing Governmental Approval or Permit as a result of any such Change Order or Supervening Event), Developer shall promptly notify the Enterprises and proceed or continue to design, build, operate and maintain the Project according to the requirements of this Agreement and the design, construction, operations and maintenance means and methods set out, referred to or contemplated in the Department Provided Approvals, and any other Governmental Approvals and any Permits that have been or are subsequently obtained.

d. No such inability of Developer to obtain, modify, renew or extend any Governmental Approval or Permit for which it is responsible pursuant to Section 8.4.2.a shall itself constitute a Supervening Event or other legal or contractual basis for any claim or relief hereunder by or for Developer to the extent that the cause of, or reason for, such inability does not otherwise constitute a Supervening Event or such other basis for any claim or relief.

8.4.4. Enterprise assistance in obtaining and modifying Governmental Approvals and Permits

a. The Enterprises shall, as and when expressly provided in this Agreement and otherwise at the reasonable request of Developer, where necessary to obtain, modify, renew or extend any Governmental Approval or Permit for which Developer is otherwise responsible pursuant to Section 8.4.2.a, use Reasonable Efforts to:

i. execute (or, as applicable, facilitate execution by CDOT of) such documents as can only be executed by the Enterprises or, as applicable, CDOT;

ii. make such applications or recordings (or, as applicable, facilitate such applications or recordings by CDOT), either in its own name or jointly with Developer, as can only be made by the Enterprises or, as applicable, CDOT, or in joint names of Developer and the Enterprises or, as applicable, CDOT; and

iii. attend meetings and cooperate with any relevant Governmental Authority, Utility Owner or Railroad as reasonably requested by Developer (or, as applicable, facilitate such attendance and cooperation by CDOT), in each case within a reasonable period of time after being requested to do so by Developer.

b. Subject to any pre-agreed scope of Work and budget and to any rights of Developer that arise as a result of the occurrence of any Developer Change documented in a Change Order or Supervening Event, Developer shall fully reimburse the Enterprises for all reasonable costs and expenses they and, as applicable, CDOT, incur as a result of the Enterprises complying with their obligations pursuant to Section 8.4.4.a, provided that, except to the extent provided pursuant to Section 8.4.3.b, Developer shall not be responsible for the payment of the Enterprises' and, as applicable, CDOT's costs and expenses incurred in obtaining, modifying, renewing or extending any Department Provided Approval.

8.5. Third Party Agreements

8.5.1. Compliance with Third Party Agreements and performance of related Work

Developer shall not, and shall ensure that each of its Subcontractors and each of their respective Subcontractors shall not, take any action (or refrain from taking any action) in a manner that is calculated or intended to directly or indirectly prejudice or frustrate the performance by any party to a Third Party Agreement of its obligations thereunder.

8.5.2. Designation of third party agreements

The Enterprises may, in their discretion and at any time, by notice to Developer require Developer to comply with the terms (to the extent specified in such notice) of:

a. an agreement (a copy of which shall be attached to such notice) that is not prior to such notice a Third Party Agreement and to which either or both of the Enterprises and/or CDOT is a party with:

i. any Governmental Authority, Utility Owner or Railroad; or

ii. any property owner or other Person:

A. having jurisdiction over any aspect of the Project or Work; or

B. having any property interest affected by the Project or the Work; and

b. any amendment or modification of an existing Third Party Agreement (a copy of which amendment or modification shall be attached to such notice),

and, following delivery of any such notice, such agreement, amendment or modification shall become a Third Party Agreement or amend or modify the existing Third Party Agreement, as the case may be, for purposes of this Agreement.

8.5.3. Restrictions on new third party agreements

Unless expressly Approved by the Enterprises, Developer shall not enter into, and shall ensure that no other Developer-Related Entity enters into, any agreement with any Person referred to in Section 8.5.2.a.i or 8.5.2.a.ii, that in any way purports to, or reasonably could be interpreted to, obligate the Enterprises, CDOT or the State. For certainty, this Section 8.5.3 shall not apply to any Sprint Reimbursement Agreement, to which Section 4.6.1.b of Schedule 10 (*Design and Construction Requirements*) shall apply.

8.5.4. Sharing of Recovery

Subject to Section 15.7.3, if either Party shall, by exercising any right under any URA, any Utility Work Order, any RRA or the Cover Maintenance Agreement, or by asserting any Claim against any Utility Owner, Railroad or Cover Top Maintainer in connection with the same, obtains payment in respect of Losses incurred by the other Party which (in aggregate together with other amounts obtained) are in excess of its own Losses (which, for such purposes, shall be deemed to include any reasonable costs and expenses incurred by it in obtaining such payment), then the recovering Party shall promptly release such excess payment to the other Party up to an amount equal to such other Party's Losses, provided that (without prejudice to Section 15.7.3.a) this Section 8.5.4 shall not be interpreted as meaning that any Party shall be obliged to exercise any such right or assert any such Claim.

8.5.5. Enforcement of RRAs

The Enterprises shall, upon the reasonable request of Developer, use Reasonable Efforts to enforce their rights under each RRA against the Railroad that is party to such agreement.

8.6. Compliance with Project Standards

8.6.1. Monitoring of Project Standards

a. Developer shall, and shall ensure that each of its Subcontractors and each of their respective Subcontractors shall, monitor and familiarize themselves with changes or additions to, or replacements of, the Project Standards (in the case of Subcontractors, to the extent applicable to their portion of the Work).

b. Developer shall notify the Enterprises of any change or addition to, or replacement of, any Project Standard promptly after it becomes aware of such change, addition or replacement.

8.6.2. Changes, additions or replacements to or of Project Standards

a. Subject to Section 8.6.2.b, Developer shall not be required to comply with any change or addition to, or replacement of, a Project Standard, except pursuant to an Enterprise Change documented in a Change Order or a Directive Letter.

b. If and to the extent that compliance by Developer with any change or addition to, or replacement of, a Project Standard is required for Developer's continued compliance with Law (the burden of establishing which shall be on Developer), but without limiting Developer's obligation to at all times comply with Law, the Enterprises shall be required to issue an Enterprise Change Notice to require compliance by Developer with such change or addition to, or replacement of, a Project Standard.

c. Notwithstanding any Enterprise Change documented in a Change Order or a Directive Letter in relation to any change or addition to, or replacement of, an O&M Standard, Developer shall only be entitled to compensation for Change in Costs resulting from any such Enterprise Change if and to the extent such Enterprise Change:

i. is initiated to conform the O&M Standards with a Discriminatory Change in Law or a Qualifying Change in Law;

ii. requires Developer to incur any expenditure that would be treated as a capital expenditure in accordance with GAAP (in which event, for certainty, Developer shall be entitled to compensation for any resulting Change in Costs and not only any resulting capital expenditure); or

iii. is materially more onerous as applied to the Project, Developer or any Principal Subcontractor than the application thereof to (A) Similar Projects of either Enterprise or CDOT or (B) the principal contractors responsible for such projects,

provided that, in each case, such Enterprise Change does not arise as a result of or is not made in response to any breach of Law, Governmental Approval, Permit or this Agreement, or fraud, willful misconduct, criminal conduct, recklessness, bad faith or negligence by or of any Developer-Related Entity.

9. DEVELOPER'S CONSTRUCTION PERIOD OBLIGATIONS

9.1. Obligation to Perform Construction Work; Restrictions on Construction Work

a. Developer shall perform:

i. the NTP1 Work on and from (but (other than, for certainty, those preparatory activities referenced in paragraphs b. and c. of the definition of NTP1 Work in Part A of Annex A (*Definitions and Abbreviations*)) not prior to) the date of issuance of NTP1;

ii. subject to Section 9.1.a.i, all the Construction Work and all the O&M Work During Construction (other than the performance of Snow and Ice Control Services) on and from (but not prior to) the date of issuance of NTP2; and

iii. Snow and Ice Control Services, on and from the Snow and Ice Control Commencement Date (subject to any obligation of Developer to perform such services prior to such date pursuant to Section 2.2.2.b of Schedule 11 (*Operations and Maintenance Requirements*)),

pursuant to and in compliance with the terms, conditions and requirements of this Agreement.

b. Unless expressly Approved by the Enterprises, Developer shall not perform any Construction Work (other than Utility Work) consisting of activities that disturb, alter or otherwise physically impact any part of the Right-of-Way (or of any Additional Right-of-Way) that is outside the ROD Construction Limits.

9.2. Schedule Management, Completion and Commissioning

9.2.1. Milestone Completion, Substantial Completion and Final Acceptance

a. Subject to Section 9.2.2, Developer shall achieve:

i. Substantial Completion by the Baseline Substantial Completion Date (and, by doing so, achieve Milestone Completion of each Payment Milestone); and

ii. Final Acceptance by the Final Acceptance Deadline Date.

b. The Baseline Substantial Completion Date and the Final Acceptance Deadline Date shall only be extended pursuant to this Agreement as Agreed or Determined either pursuant to a Change or following the occurrence of a Relief Event or a Compensation Event.

9.2.2. Project Schedule

Notwithstanding anything to the contrary in this Agreement, including Section 9.2.1.a, and without prejudice to the rights of the Enterprises:

a. that arise as a result of the Noncompliance Event specified in item 2.32 in Table 6A.2; or

b. that arise as a result of the occurrence of Developer Default number (5) in Section 32.1.1,

Developer's failure to comply with the Project Schedule (including its failure to comply with Sections 9.2.1.a.i or 9.2.1.a.ii) in carrying out the Construction Work shall not constitute a breach of this Agreement or a Developer Default.

9.2.3. Float

a. Float shall be considered as a jointly owned, expiring resource available to the Project for the benefit of all Parties (and not for the exclusive benefit of either the Enterprises or Developer), available to each of them as needed to absorb delays caused by Supervening Events or other events to achieve interim completion dates and deadlines set out in the Project Schedule and, ultimately, to achieve Milestone Completion of each Payment Milestone by the relevant Milestone Completion Target Date, Substantial Completion by the Baseline Substantial Completion Date and Final Acceptance by the Final Acceptance Deadline Date.

b. Notwithstanding Section 9.2.3.a, Float shall not be available to the Enterprises to absorb delays caused by the occurrence of a Compensation Event as described in paragraphs a.i. (but only with respect to a material breach of this Agreement by the Enterprises), a.ii., g., i.i., j., l., m. or o. of the definition thereof in Part A of Annex A (*Definitions and Abbreviations*).

9.3. Payment and Performance Security

9.3.1. Obligation to obtain and maintain Contractor Bonds

a. Developer shall deliver to the Enterprises Contractor Bonds with respect to:

i. collectively (or, to the extent Accepted pursuant to Section 9.3.3, separately), the Construction Work and the O&M Work During Construction; and

ii. the O&M Work After Construction,

in each case as and when required pursuant to Schedule 3 (*Commencement and Completion Mechanics*).

b. Thereafter, Developer shall ensure that each such Contractor Bond shall remain in full force and effect, and in full compliance with the definition of Contractor Bond set out in Part A of Annex A (*Definitions and Abbreviations*), provided that, subject to Sections 9.3.1.c and 9.3.1.d, the terms of the Principal Subcontractor Direct Agreements and the Enterprises' rights to draw on any Contractor Bond in accordance with its terms

and the terms of this Agreement, promptly following the earlier of the Termination Date and:

i. the Final Acceptance Date, the Enterprises shall release or return to Developer each Contractor Bond delivered pursuant to Section 9.3.1.a.i; and

ii. the Expiry Date, the Enterprises shall release or return to Developer each Contractor Bond delivered pursuant to Section 9.3.1.a.ii.

c. Notwithstanding Section 9.3.1.a, Developer acknowledges and agrees that, to the extent required by Law in connection with Work to be performed during the Term, or as otherwise required in connection with a Change Order or Directive Letter, Developer shall obtain and maintain additional payment and/or performance security in such amounts, for such periods of time and in such form (if any) as required by Law or in connection with a Change. For purposes of this Agreement, references to a Contractor Bond shall be deemed to include any such additional security and any such additional security shall, subject to compliance with Law or the terms of any Change Order or Directive Letter, be provided by and maintained with an Eligible Surety or otherwise pursuant to Section 9.3.3. The Enterprises shall release or return to Developer any such additional security obtained and maintained pursuant to this Section 9.3.1.c at the end of the relevant period during which Developer is obligated to obtain and maintain the same.

d. Developer shall be entitled to replace any Contractor Bond delivered pursuant to Section 9.3.1.a or otherwise obtained and maintained pursuant to Section 9.3.1.c. Promptly following such replacement, and subject to Developer's continued compliance with Section 9.3.1.a or Section 9.3.1.c, as applicable, the Enterprises shall release or return to Developer such replaced Contractor Bond.

9.3.2. Methods of providing Contractor Bonds

Subject to Section 9.3.3, Developer may, in its discretion (but subject always to compliance with any Law referred to in Section 9.3.1.c), satisfy its obligations to provide Contractor Bonds under Sections 9.3.1.a and 9.3.1.c by:

a. procuring Contractor Bonds from an Eligible Surety which provide security for:

i. Developer's performance obligations to the Enterprises under this Agreement; and

ii. Developer's payment obligations to Subcontractors and laborers,

in which case the Enterprises shall be the primary obligees, and the Lenders or their Collateral Agent may be additional obligees, under such Contractor Bonds; or

b. procuring such Contractor Bonds from its Principal Subcontractors so that such bonds as provided by an Eligible Surety are security for:

i. such Principal Subcontractor's performance obligations to Developer under its Subcontract; and

ii. such Principal Subcontractor's payment obligations to lower tier Subcontractors and to laborers,

in which case Developer shall be the primary obligee under such Contractor Bonds and the Enterprises shall be, and the Lenders or their Collateral Agent may be, additional obligees.

9.3.3. Alternative Forms of Security

Developer may satisfy its obligations under Section 9.3.1.a in a manner that provides security at least equivalent (including with respect to the amount thereof) to the security required to be provided pursuant to either Section 9.3.2.a or Section 9.3.2.b by delivering to the Enterprises for their Acceptance:

a. alternative form(s) of payment and/or performance surety bond(s) that are not in substantially the form set out in Schedule 20 (*Forms of Contractor Bonds*);

b. one or more irrevocable on demand letters of credit from Eligible Financial Institutions which, with respect to satisfaction of Developer's obligations under Section 9.3.1.a.i, may only be in relation to the O&M Work During Construction (and not, for certainty, the Construction Work); and

c. one or more parent company guarantees with respect to satisfaction of Developer's obligations under Section 9.3.1.a.ii only (but not, for certainty, Section 9.3.1.a.i),

provided that in each case Developer shall deliver any such proposed alternative form(s) of security to the Enterprises for their Acceptance at least 30 Calendar Days prior to the date on which Developer is required, or otherwise proposes, to have such security in full force and effect for purposes of compliance with its obligations under this Agreement.

9.3.4. No Release

Any demand made by an obligee under any Contractor Bond shall not serve to waive, or release Developer from, any of Developer's obligations under this Agreement.

9.4. Warranties and Liability for Defects

9.4.1. Warranties

Developer warrants that each Warrantied Element:

a. shall be designed, constructed and completed in a manner that:

i. complies with Good Industry Practice; and

ii. meets or exceeds all other applicable requirements of this Agreement;

b. shall, except as otherwise expressly permitted under this Agreement, be comprised of new materials; and

c. shall be of good quality and free from faults and Defects,

(a., b. and c., together with the Additional Warranties, the "Warranties"). For certainty, all provisions of this Section 9.4 shall apply to the Additional Warranties, except to the extent expressly specified otherwise.

9.4.2. Warranty Beneficiaries

a. The Warranties (including, for certainty, the Additional Warranties) are for the express benefit of the Enterprises, CDOT and, with respect to those Warrantied Elements to be maintained by each of them, the City of Denver and Denver Public Schools (all such beneficiaries, together, the "Warranty Beneficiaries"). Developer acknowledges and agrees that the Enterprises shall have the right, on behalf of any Warranty Beneficiary, to enforce the Warranties relating to such Warranty Beneficiary's Warrantied Elements and Developer's obligations under Sections 9.4.1 to 9.4.5 as such obligations apply to such Warrantied Elements. The Enterprises shall coordinate the exercise of such right of enforcement with each Warranty Beneficiary, with a view to the Enterprises being the primary party with which Developer is required to interface in connection with any such enforcement.

b. The rights and remedies of the Enterprises or any Warranty Beneficiary arising with respect to any breach of the Warranties shall not limit Developer's liability or responsibility, or the Enterprises' rights and remedies, under this Agreement or Law with respect to the Work, including with respect to any Defect, Nonconforming Work, Noncompliance Event, Non-Permitted Closure, breach, fraud, willful misconduct, criminal conduct, recklessness, bad faith or negligence.

9.4.3. Warranty Period

a. Subject to Section 9.4.3.b:

i. the Warranties (other than the Additional Warranties) shall remain in effect until:

A. with respect to Warranties for the benefit of:

I. CDOT or the Enterprises (and no other Person); or

II. the City of Denver (excluding Warranties with respect to that portion of the Cover that is within the scope of the Cover Top O&M Work),

the first anniversary of the Final Acceptance Date; and

B. with respect to Warranties for the benefit of:

I. Denver Public Schools; or

II. the City of Denver with respect to that portion of the Cover that is within the scope of the Cover Top O&M Work,

the second anniversary of the Final Acceptance Date; and

ii. the Additional Warranties shall each remain in effect until the expiry date of the applicable warranty period specified in Schedule 10 (*Design and Construction Requirements*),

in the case of each Warranty, the "Warranty Period".

b. Following Approval pursuant to Section 9.4.4.a by the Enterprises of any work performed to remedy a Defect or any other breach of the Warranties in relation to a Warrantied Element, the Warranties as to each affected part of a Warrantied Element shall automatically extend beyond the original Warranty Period to the extent less than one year remains of such original period, such that each affected part of such Warrantied Element shall have a one-year extended Warranty Period ending on the first anniversary of the completion of such remedial work. For certainty, the extended Warranty Period in relation to any part of the Warrantied Elements cannot exceed the first anniversary of the end of the original Warranty Period.

9.4.4. Developer obligation to remedy Warrantied Elements

a. Developer shall (at its own risk, cost and expense, including the risk, cost and expense of associated design work) promptly (and, to the extent applicable, no later than any required date of completion specified in any Warranty Defects List) investigate, repair, replace or otherwise correct and fully remedy any Defect in the Warrantied Elements or any other breach of the Warranties notified to it by the Enterprises prior to the expiry of the applicable Warranty Period (including, for certainty, as such period may be extended pursuant to Section 9.4.3). The Enterprises shall Approve the completion of all work with respect to any such Defect in the Warrantied Elements or any other such breach of the Warranties on the basis that the relevant Construction Work completed as a result of the correction and remedy of such Defect or breach is in full compliance with the applicable requirements of this Agreement. The Enterprises shall be entitled to take action to investigate, repair, replace or otherwise correct and fully remedy any Defect in the Warrantied Elements and any other breach of the Warranties pursuant to Section 23.4.1.c if Developer fails to comply with its obligations pursuant to this Section 9.4.4.a.

b. Developer acknowledges and agrees that the Enterprises, CDOT and each Warranty Beneficiary may perform work on any Warrantied Element during the Warranty Period, to the extent they or it otherwise have or has rights to do so, without voiding any Warranty, provided that Developer:

i. shall not be liable for any Defect or any other breach of the Warranties caused, or to the extent exacerbated by, such work; and

ii. does not hereby waive any defenses, rights, claims or remedies to which it may otherwise be entitled as a result of the performance of such work.

9.4.5. Warranty Defects List

a. At any time prior to the expiry of the applicable Warranty Period (including, for certainty, as extended pursuant to Section 9.4.3) the Enterprises and, with respect to any Warrantied Element maintained by it, each Warranty Beneficiary shall, in their discretion, have the right to access and conduct an inspection of each Warrantied Element. Following such inspection, the Enterprises, in consultation with any relevant Warranty Beneficiary, shall have the right, but not the obligation, to identify Defects and breaches of the Warranties in relation to the relevant Warrantied Element and to prepare and deliver to Developer a list of such Defects and breaches (the "Warranty Defects List") and a required date of completion of the required Warranty work, provided that any such list shall be delivered to Developer prior to the expiry of the applicable Warranty Period.

b. Developer shall notify the Enterprises within 10 Working Days of receipt of any Warranty Defects List whether it agrees with or disputes the contents of such Warranty Defects List. If Developer fails to provide such notice within such period, then Developer shall be deemed to agree with the contents and requirements of such Warranty Defects List.

c. Developer shall reimburse the Enterprises (and, at the Enterprises' direction, any applicable Warranty Beneficiary) for all reasonable costs and expenses incurred in conducting an inspection pursuant to Section 9.4.4.a, this Section 9.4.5, or otherwise pursuant to this Agreement, that identifies a Defect in the Warrantied Elements or any other breach of the Warranties.

9.4.6. Standard Warranties

In addition to the Warranties, Developer shall in accordance with Good Industry Practice use Reasonable Efforts to procure for itself customary supplier, manufacturer and other third party warranties, which warranties shall, to the extent commercially available, be fully transferrable and assignable to the Enterprises (and, to the extent that any such warranty is in respect of a Warrantied Element, the relevant Warranty Beneficiary) upon the Expiry Date or, if earlier, the Termination Date (or, in the case of any such warranty in respect of a Warrantied Element, if earlier, upon expiry of the applicable Warranty Period).

9.5. Assignment of Certain Causes of Action

Developer agrees to assign to the Enterprises all rights, title, and interest in and to all causes of action Developer may have under Section 4 of the Clayton Act (15 U.S.C. § 15) or under comparable State Law, arising from purchases of goods, services or materials pursuant to this Agreement. This assignment shall be made and become effective automatically upon payment of the Substantial Completion Payment, without further acknowledgment by the Parties.

10. DEVELOPER'S OPERATING PERIOD OBLIGATIONS

Developer shall perform the O&M Work After Construction from and after the Substantial Completion Date pursuant to and in compliance with the terms, conditions and requirements of this Agreement.

11. PAYMENTS IN CONSIDERATION OF WORK PERFORMED AND PAYMENT ASSURANCES

11.1. Payments in Consideration of Work Performed

11.1.1. Milestone Payments

The Enterprises shall pay the Milestone Payments to Developer in accordance with Part 1 of Schedule 4 (*Payments*) and Schedule 5 (*Milestone Payments*).

11.1.2. Performance Payments

The Enterprises shall pay the Performance Payments to Developer in accordance with Part 2 of Schedule 4 (*Payments*) and Schedule 6 (*Performance Mechanism*).

11.2. Enterprise Credit Related Covenants

11.2.1. Maintenance of Bridge Surcharges

BE agrees that it shall not reduce any Bridge Surcharges charged during the Term below the maximum rates authorized by C.R.S. § 43-4-805, as in effect as of the Setting Date.

11.2.2. Maintenance of Enterprise status

Neither Enterprise shall take any action that would cause it to fail (or refrain from taking any action that would prevent it from failing) to qualify as a government-owned business within CDOT or an enterprise under Article X, Section 20 of the State Constitution unless such failure will not adversely affect the interests of Developer or any Lender.

11.2.3. IAA enforcement, amendments and waivers

a. The Enterprises agree that they shall not, without Developer's prior written consent (such consent not to be unreasonably withheld), amend or waive any of the following provisions of the IAA:

i. Section III., subsections 2, 4-7, 9, and 11-12;

ii. Section IV., subsections 2-5, 6 (excluding d-f) and 8;

iii. Section V., subsections 5-8;

iv. Section VI.;

v. Section VII.;

vi. Section VIII., subsections 1-4;

vii. Section IX., subsections 1-3, 7, 12, and 14; and

viii. Exhibits A and B,

except that such consent shall not be required in respect of any such amendment or waiver that will not adversely affect the interests of Developer or any Lender (a copy of which amendment or waiver the Enterprises shall in each case deliver to Developer promptly following execution thereof).

b. The Enterprises shall at all times enforce their rights under the provisions of the IAA specified in Section 11.2.3.a as necessary to ensure CDOT's compliance with the terms of such provisions, unless any failure of the Enterprises to do so will not adversely affect the interests of Developer or any Lender.

12. COOPERATION AND COORDINATION WITH RELATED TRANSPORTATION FACILITIES, ON LIMITED O&M WORK SEGMENTS AND WITH OTHER DEPARTMENT PROJECTS

12.1. Duty to Cooperate and Coordinate

Without limiting its other obligations under this Agreement, Developer shall:

a. cooperate and coordinate with the Enterprises, CDOT and any relevant third party (including the City of Denver in relation to the Denver Planned Projects) as reasonably requested by the Enterprises, with regard to the design, construction, operation and/or maintenance of, respectively, the Project (including with regard to the Limited O&M Work Segments) and the Related Transportation Facilities; and

b. otherwise use Reasonable Efforts in order to minimize any adverse impact:

i. on the Work or the operation of the Project as a result of the design, construction, operation and/or maintenance of any Related Transportation Facility and the Limited O&M Work Segments; and

ii. on (A) any Related Transportation Facility, (B) the Limited O&M Work Segments and (C) any Other Department Project, as a result of the Work.

12.2. Compatibility and Integration with Related Transportation Facilities

Developer shall:

a. as part of the Construction Work, locate, configure, design and construct the endpoints, interfaces, interchanges, ramps, intersections, crossings, entrances and exits of the Project so that the Project will be compatible and integrated with the location, configuration, design, operation and maintenance of, and provide a smooth, safe and orderly transition of traffic to and from, each Related Transportation Facility that:

i. exists on the Setting Date; or

ii. is a CCD Identified Future Improvement,

in each case in accordance with Good Industry Practice and to the extent possible in light of the Known or Knowable configuration, design and use of such facilities;

b. as part of the O&M Work, and without prejudice to Developer's right arising as a result of the occurrence of any Compensation Event as described in paragraph n. of the definition thereof in Part A of Annex A (*Definitions and Abbreviations*), provide for, facilitate and accommodate such compatibility, integration and transition with, to and from Related Transportation Facilities in accordance with Good Industry Practice; and

c. not take any action (or refrain from taking any action) in a manner that is calculated or intended to directly or indirectly prejudice or frustrate the construction, operation and maintenance of any Related Transportation Facility.

12.3. Procurement of Other Department Projects

12.3.1. In response to the Enterprises' written request, Developer shall inform the Enterprises within 20 Working Days of receipt of such request of all material facts or circumstances of which it is aware that might reasonably be expected to affect the procurement, design, construction, operation or maintenance of any Other Department Project, or any other Related Transportation Facility, in the light of the details concerning such project or facility that the Enterprises have provided to Developer or that are otherwise known by Developer.

12.3.2. If the Enterprises are preparing to issue or have issued any Other Department Project Procurement Materials or are otherwise seeking offers from any Person or negotiating with any Person in respect of any proposed Other Department Project, then Developer shall use Reasonable Efforts as the Enterprises may reasonably request to assist such procurement, including providing access to the Enterprises, CDOT and each of their respective designees to:

a. each part of the Site for the purpose of surveying, inspecting or investigating the relevant parts thereof (provided that the Enterprises shall, and shall require that other parties requiring access at the Enterprises' request shall, at all times comply with all relevant site rules and safety regulations in relation to the Site); and

b. Project Records, but only to the extent that the Enterprises may otherwise require Developer to deliver or to procure the delivery of such records under the terms of this Agreement,

in each case solely and to the extent necessary to procure and award the relevant Other Department Project.

12.3.3. If the Enterprises or CDOT award or otherwise undertake any Other Department Project other than with Developer, then Developer shall:

a. use Reasonable Efforts to cooperate and coordinate with the Enterprises, CDOT and each of their respective designees engaged in such Other Department Project as required pursuant to Section 12.1;

b. not take any action (or refrain from taking any action) in a manner that is calculated or intended to directly or indirectly prejudice or frustrate such Other Department Project; and

c. at reasonable times and upon reasonable notice, allow access to the Enterprises, CDOT and each of their respective designees to each part of the Site as is reasonably necessary to facilitate the carrying out of and interface with the Other Department Project (provided that the Enterprises shall, and shall require that CDOT and all other parties requiring access shall, at all times comply with all relevant site rules and safety regulations in relation to the Site),

provided that Developer shall not be required to take (or refrain from taking) any action (including allowing access pursuant to Section 12.3.3.c) that would reasonably be anticipated to adversely affect the Work or the carrying out of Developer's other obligations under this Agreement.

12.4. Enterprises' Assistance

The Enterprises shall:

a. at reasonable times and upon reasonable notice, and subject to CORA, provide to Developer reasonable access to plans, surveys, drawings, specifications, reports and other documents and information in the possession of, or otherwise accessible by, the Enterprises pertaining to Related Transportation Facilities and Other Department Projects, including the use of Reasonable Efforts to provide Developer with copies of the same; and

b. at Developer's request, use Reasonable Efforts to provide assistance to Developer in fulfilling its obligations under Sections 12.1 through 12.3, provided that in no event shall the Enterprises be required to bring any legal action or proceeding against any third party.

12.5. Traffic Management

12.5.1. Developer acknowledges that the Enterprises, CDOT, the City of Denver, Emergency Services and other Governmental Authorities with traffic management authority under Law, shall have, without obligation or liability to Developer, the right to conduct traffic management activities pursuant to standard practices and procedures in effect from time to time:

a. on the Right-of-Way, any Additional Right-of-Way and any other part of the Site that is open for use by the traveling public;

b. in connection with the conduct of operations and maintenance activities by CDOT in relation to the Limited O&M Work Segments;

c. in connection with any Other Department Project; and

d. on any Related Transportation Facility,

which activities shall not, for certainty, themselves constitute a Supervening Event.

12.5.2. Except in the case of an Emergency, the Enterprises shall use Reasonable Efforts to notify Developer in advance of any Person conducting any traffic management activities as permitted by Section 12.5.1 to the extent that the Enterprises are aware of such activities, provided that no such notice shall be required as to activities of which Developer is known by the Enterprises to be aware (whether due to prior notice, the terms of this Agreement or otherwise). To the extent that any such traffic management activities prevent Developer from accessing locations for the purpose of curing any Category 1 Defect or Category 2 Defect, the Defect Remedy Period applicable to the relevant Category 1 Defect or Category 2 Defect shall be extended by the period of time that such access is prevented.

13. HANDBACK

Developer shall prepare to hand back the Project, and at the Expiry Date hand back the Project, in accordance with its obligations under Schedule 12 (*Handback Requirements*).

PART D: CHANGES AND SUPERVENING EVENTS

14. CHANGE PROCEDURE

14.1. Right to Initiate Changes

Subject to the limitations set out in Schedule 24 (*Change Procedure*), either Party may (and, with respect to the Enterprises, pursuant to Section 8.6.2.b shall) propose a Change by submitting a notice to the other Party. Such a notice:

a. submitted by the Enterprises to Developer (an "Enterprise Change Notice") shall be processed pursuant to Sections 1 and 3 of Schedule 24 (*Change Procedure*); and

b. submitted by Developer to the Enterprises (a "Developer Change Notice") shall be processed pursuant to Sections 2 and 3 of Schedule 24 (*Change Procedure*).

14.2. Directive Letters

Pursuant to Section 1.4 of Schedule 24 (*Change Procedure*), the Enterprises may deliver a Directive Letter to Developer at any time after the Enterprises' submission of a related Enterprise Change Notice to Developer.

15. SUPERVENING EVENTS

15.1. Submission of Supervening Event Notices and Submissions

15.1.1. Developer shall (and shall ensure that each of its Principal Subcontractors shall) develop and maintain procedures pursuant to Good Industry Practice to anticipate, identify and notify the Enterprises (or, in the case of the Principal Subcontracts, Developer) of the occurrence of Supervening Events, provided that:

a. such obligation, and Developer's obligations under Sections 15.1.2 through 15.1.5, shall not apply to any Enterprise Change initiated pursuant to a Change Order; and

b. Section 15.1.2.a shall not apply to any Enterprise Change initiated pursuant to a Directive Letter.

15.1.2. If Developer becomes aware or determines that a Supervening Event has occurred (regardless of whether such event has concluded or is continuing, and without limiting any other obligation Developer may have to notify the Enterprises or any other Person of, or in relation to, such event pursuant to this Agreement, Law, any Permit or Governmental Approval or otherwise) or, with respect to Section 15.1.2.a only, is likely to occur, then, subject to Section 15.1.4, it shall:

a. promptly, and in any event no later than 10 Working Days, after becoming aware of such occurrence or making a determination that such event is likely to occur submit to the Enterprises a notice in the form provided in Part A of Schedule 21 (*Forms of Supervening Event Notices and Submissions*) (a "Supervening Event Notice"); and

b. thereafter, and to the extent a Supervening Event has occurred:

i. promptly, and in any event no later than 20 Working Days, after becoming aware of such occurrence submit to the Enterprises a submission in the form provided in Part B of Schedule 21 (*Forms of Supervening Event Notices and Submissions*) (a "Preliminary Supervening Event Submission"); and

ii. promptly after becoming aware of such occurrence, and in any event no later than the later of (A) 80 Working Days after becoming aware thereof and (B) 40 Working Days after the conclusion of such Supervening Event, submit to the Enterprises a submission in the form provided in Part B of Schedule 21 (*Forms of Supervening Event Notices and Submissions*) (a "Detailed Supervening Event Submission"),

provided that, for purposes of determining when Developer is required to submit any notice or submission under this Section 15.1.2, Developer shall be deemed to be aware of any

Supervening Event on the date of its occurrence to the extent Developer failed to comply with its obligations under Section 15.1.1.

15.1.3. The Enterprises shall respond promptly to any Supervening Event Submission submitted by Developer pursuant to Section 15.1.2.b and, as applicable, to any notice or submission in relation thereto subsequently submitted by Developer pursuant to Section 15.1.5, in each case for the purpose of attempting, together with Developer, to reach an agreement pursuant to Section 15.3.2.

15.1.4. Developer may satisfy its obligation under Section 15.1.2.b.i by instead submitting a Detailed Supervening Event Submission promptly and in any event no later than the expiry of the applicable period that would have otherwise applied under Section 15.1.2.b.i.

15.1.5. After Developer submits any notice or submission to the Enterprises pursuant to Section 15.1.2 or 15.1.4, Developer shall, with respect to any Supervening Event that has occurred, promptly:

a. notify the Enterprises if at any time it becomes aware of any further material information relating to the Supervening Event, to the extent that such information is new or renders information previously submitted materially inaccurate or misleading; and

b. following the Enterprises' reasonable request, or as required pursuant to the terms of any written agreement previously made pursuant to Section 15.3.2 (including with respect to a continuing Supervening Event), submit to the Enterprises additional information related to the relevant Supervening Event.

15.2. Limitations on Supervening Event Submissions

15.2.1. Failure to provide timely notice

If, following the occurrence of a Supervening Event, Developer fails to comply with its obligations under any of Sections 15.1.2.a, 15.1.2.b and 15.1.5 within the applicable time period (in each case measured from the date on which Developer first became aware (or, in accordance with the proviso to Section 15.1.2, is deemed to have become aware) or determined that a Supervening Event had occurred) specified in such Sections, then Developer shall be deemed to have irrevocably and forever waived and released:

a. the portion of any claim or right with respect to such event (including the right to take into account for calculation purposes, pursuant to (i) Section 15.7 or (ii) the definition of Appendix B Parcel Costs in Part A of Annex A (*Definitions and Abbreviations*), the amount of certain Losses whether or not the Enterprises would owe Developer compensation in respect of any such Loss as a result of such calculation) that would relate to adverse effects accruing, persisting or increasing after the expiry of the applicable period or otherwise due to such failure and until Developer complies with the relevant obligation; and

b. any and all claim or right with respect to such event (including the right to take into account for calculation purposes, pursuant to (i) Section 15.7 or (ii) the definition of Appendix B Parcel Costs in Part A of Annex A (*Definitions and Abbreviations*), the amount of certain Losses whether or not the Enterprises would owe Developer compensation in respect of any such Loss as a result of such calculation) if Developer has failed to:

i. submit a Supervening Event Notice on or before the 30th Working Day after Developer became aware (or, in accordance with the proviso to Section 15.1.2, is deemed to have become aware) of the occurrence of a Supervening Event;

ii. submit a Preliminary Supervening Event Submission on or before the 80th Working Day after Developer became aware (or, in accordance with the proviso to Section 15.1.2, is deemed to have become aware) of the occurrence of a Supervening Event; or

iii. submit a Detailed Supervening Event Submission on or before the later of (A) the 140th Working Day after becoming aware (or, in accordance with the proviso to Section 15.1.2, is deemed to have become aware) of the occurrence of a Supervening Event and (B) the 100th Working Day after the conclusion of such Supervening Event.

15.2.2. Duty to mitigate

a. Without modifying its other obligations under this Agreement, Developer shall use Reasonable Efforts to mitigate the effects of any Supervening Event, including by re-sequencing, reallocating or redeploying its forces to other parts of the Work.

b. Developer shall not be entitled to any extension of time, compensation or other relief pursuant to this Section 15 to the extent such extension of time, compensation or other relief would have been avoided by its compliance with Section 15.2.2.a.

15.2.3. Events affecting Financial Close

Without prejudice to Developer's rights and the Enterprises' obligations under Schedule 1 (*Financial Close*), Developer shall not be entitled to claim or receive:

a. an extension of the Financial Close Deadline; and/or

b. any relief from and/or compensation in connection with Developer's performance of its obligations with respect to Financial Close pursuant to Sections 27.1 and 27.2 and Schedule 1 (*Financial Close*),

pursuant to this Section 15.

15.3. Resolution

15.3.1. If Developer has complied with its obligations under Section 15.1 and, through the submission of a Detailed Supervening Event Submission, has demonstrated that the Supervening Event occurred (regardless of whether such event has concluded or is continuing) then, subject to Section 15.2:

a. in the case of any Relief Event or Compensation Event, Developer shall be relieved from the performance of its obligations under this Agreement to the extent, and only to the extent, that Developer's inability to perform such obligations is due directly to, and limited to the duration of the direct effects of, such Relief Event or Compensation Event, provided that Developer shall not be excused from timely compliance with any obligation to make a payment pursuant to this Agreement due to the occurrence of any Relief Event or Compensation Event;

b. in the case of any Relief Event or Compensation Event:

i. to the extent that any Noncompliance Event is directly attributable to the occurrence of such Relief Event or Compensation Event, subject to Section 15.3.1.a, no Noncompliance Points shall accrue in respect of such Noncompliance Event; and

ii. to the extent that any Closure is directly attributable to the occurrence of such Relief Event or Compensation Event, subject to Section 15.3.1.a, such Closure shall be an Excused Closure, but only to the extent that paragraphs g. and h. of the definition thereof in Part A of Annex A (*Definitions and Abbreviations*) are satisfied;

c. in the case of any Relief Event or Compensation Event occurring prior to the Final Acceptance Date that:

i. affects or will affect the Critical Path, after taking into account any available Float pursuant to Section 9.2.3.a (but subject always to Section 9.2.3.b) and excluding any previous or concurrent unrelated delay for which Developer is responsible

(the resulting period of delay, measured in Calendar Days, being the "Schedule Delay Period"); and/or

ii. delays or will delay completion of the Construction Work (after taking into account any available Float pursuant to Section 9.2.3.a (but subject always to Section 9.2.3.b) and excluding any previous or concurrent unrelated delay for which Developer is responsible) required to achieve:

A. Milestone Completion of any Payment Milestone by the Milestone Completion Target Date; and/or

B. Substantial Completion by the Baseline Substantial Completion Target Date,

and, as a result, Milestone Completion of such Payment Milestone or Substantial Completion occurs or will occur, as applicable, after the relevant Milestone Completion Target Date or the Baseline Substantial Completion Target Date (the resulting period of delay with respect to such Payment Milestone or Substantial Completion, measured in Calendar Days, being a "Milestone Delay Period" and, together with any Schedule Delay Period, each a "Delay Period");

then:

iii. with respect to any such Relief Event or Compensation Event that affects or will affect the Critical Path:

A. if such Relief Event or Compensation Event occurred prior to the Baseline Substantial Completion Date, then the Baseline Substantial Completion Date shall be extended by the number of Calendar Days equal to the Schedule Delay Period;

B. if such Relief Event or Compensation Event occurred after the Baseline Substantial Completion Date but prior to the Substantial Completion Date, then the Longstop Date shall be extended by the number of Calendar Days equal to the Schedule Delay Period; or

C. if such Relief Event or Compensation Event occurred after the Baseline Substantial Completion Date but prior to the Final Acceptance Date, then the Final Acceptance Deadline Date shall be extended by the number of Calendar Days equal to the Schedule Delay Period;

d. in the case of any Relevant Event, the Enterprises shall compensate Developer pursuant to Sections 15.4 and 15.6 (without double-counting), as applicable, for Compensable Costs, in each case subject to Section 15.7; and

e. in the case of any Relief Event or Compensation Event that occurs or is continuing during the Operating Period, the Enterprises shall be entitled to deduct from any Performance Payment otherwise payable pursuant to Schedule 6 (*Performance Mechanism*) (and after taking into account any adjustment otherwise to be made to such payments pursuant to Sections 15.4 and/or 15.6, as applicable, as a result of any compensation payable pursuant to Section 15.3.1.d):

i. Developer's actual avoided costs of Work not being performed as a direct result of the occurrence or, as the case may be, continuation of such Relief Event or Compensation Event during the Operating Period; and

ii. the amount that Developer is (or, pursuant to Section 35.5.a, should be) entitled to recover under any "business interruption" coverage under the Available Insurance as a direct result of the occurrence or, as the case may be, continuation of such Relief Event or Compensation Event during the Operating Period.

15.3.2. Upon agreement between the Parties, such agreement not to be unreasonably withheld, as to:

a. the extension of time, relief and/or compensation (including the payment terms of, and documentation required for, any such compensation) to which Developer is then entitled (including, as necessary, on a retroactive basis) in respect of any Relief Event or Compensation Event as determined pursuant to Section 15.3.1; and/or

b. the amount of any Loss that Developer is then entitled to take into account for calculation purposes pursuant to (i) Section 15.7 or (ii) the definition of Appendix B Parcel Costs in Part A of Annex A (*Definitions and Abbreviations*), whether or not the Enterprises owe Developer compensation in respect of any such Loss as a result of such calculation,

the Parties shall execute a written memorandum (or, with respect to any Supervening Event that was continuing when a prior such memorandum was executed, a written addendum to such prior memorandum) in a form to be prepared by the Enterprises setting out the details of such agreement.

15.3.3. If the Parties do not reach agreement as contemplated in Section 15.3.2 and any dispute in relation to the relevant matters is resolved pursuant to the Dispute Resolution Procedure, to the extent that the Dispute Resolution Procedure does not result in a written record of such resolution equivalent to such a memorandum, the Parties shall execute such a memorandum to document such resolution.

15.3.4. Pursuant to Section 1.3.b.ii of Schedule 24 (*Change Procedure*), a Change Order implementing an Enterprise Change shall constitute an agreed memorandum for purposes of Section 15.3.2.

15.4. Payment of Change in Costs

a. Subject to this Section 15 (including, for certainty, Section 15.7), the Enterprises shall pay to Developer all Change in Costs (as documented pursuant to Section 15.4.c and, as applicable, subject to any limitations in accordance with the definition of Change in Costs in Part A of Annex A (*Definitions and Abbreviations*)) actually incurred by it as a direct result of a Compensation Event, through one, or any combination of more than one, of the following methods as determined in the Enterprises' discretion (subject to Section 15.5):

i. as a lump sum payment for work already performed (or, in the Enterprises' discretion, as a series of progress payments for payment of work as it is performed) within 45 Calendar Days of Developer's written demand for such payment;

ii. as deferred installment payments over the Term for work performed within 45 Calendar Days of Developer's written demand for any such installment payment (provided that, at any time after electing such payment method, the Enterprises may choose to accelerate compensation for work already performed through a (or a series of) lump sum payment(s) equal to the present value as of the date of payment of the remaining compensation), which deferred installment payments will leave Developer in a No Better and No Worse position; and/or

iii. as an adjustment to the "Base CPP" and/or "Base OMRP" set out in Section 2(f) of Part 2 of Schedule 6 (*Performance Mechanism*), which adjustment will leave Developer in a No Better and No Worse position.

b. Developer shall maintain (and shall ensure that each of its Subcontractors and each of their respective Subcontractors shall maintain) cost records, supporting documentation and such other Project Records as necessary to calculate and document any Change in Costs payable pursuant to Section 15.4.a.

c. Any Developer written demand for payment pursuant to Section 15.4.a shall be made in form, and accompanied by such documentation, as necessary to comply with the terms of any written memorandum executed pursuant to Section 15.3.2 (including, pursuant to

Section 15.3.4, any Change Order implementing an Enterprise Change), as applicable, and otherwise as reasonably required by the Enterprises.

15.5. Financing

15.5.1. If, pursuant to Section 15.4 or Section 15.6.3.b, the Enterprises elect to compensate Developer through Deferred Compensation, Developer shall use Reasonable Efforts to obtain:

a. funding from the Lenders, or other lenders if permitted by the Financing Documents; and/or

b. equity support from existing Equity Members of Developer,

in either case:

c. if, and only if, and to the extent necessary; and

d. on terms Acceptable to the Enterprises (and, for certainty, acceptable to Developer (acting reasonably)),

in advance of receiving the Deferred Compensation payments from the Enterprises.

15.5.2. If, despite such efforts and any compensation that is or would be paid pursuant to Section 15.4, Developer is unable to obtain such funding and/or equity support (or the Enterprises do not Accept the terms under which Developer is able to obtain additional financing), then, notwithstanding its prior election, the Enterprises shall pay the required compensation pursuant to Section 15.4.a.i or Section 15.6.3.a, as applicable.

15.6. Delay Financing Costs and Milestone Payment Delay Costs

15.6.1. To the extent that, pursuant to Section 15.3.1.d and subject to this Section 15 (including, for certainty, Section 15.7), the Enterprises are obligated to compensate Developer in respect of:

a. any Milestone Payment Delay Costs in respect of any relevant Milestone Delay Period as determined pursuant to Section 15.3.1.c.ii; or

b. any Delay Financing Costs in respect of any relevant Schedule Delay Period as determined pursuant to Section 15.3.1.c.i,

as the case may be, the Enterprises shall pay to Developer an amount equal to such Milestone Payment Delay Costs or Delay Financing Costs, as applicable, less any amount Developer is (or, pursuant to Section 35.5.a, should be) entitled to recover under any "delay in startup" coverage under the Available Insurance as a direct result of the occurrence of the Relevant Event promptly, and in any event no later than the later of:

c. 45 Calendar Days after such net amount (or any part thereof) has been Agreed or Determined; and

d. five Working Days prior to the date that such Milestone Payment Delay Costs or Delay Financing Costs become due for payment or repayment by Developer pursuant to the Financing Documents.

15.6.2. No later than 45 Calendar Days after the Substantial Completion Date, the Parties shall determine pursuant to Section 28.2 (such determination being referred to in this Section 15.6 as the "Reconciliation"), the extent to which Developer was left in a position that was No Better and No Worse as a direct result of the Delay Periods caused by any one or more Relevant Events taking into account (without double-counting):

a. payments made by the Enterprises to Developer pursuant to Section 15.6.1;

b. Milestone Payment Delay Costs and Delay Financing Costs incurred by Developer as a direct result of the occurrence of all such Relevant Events but which were not previously taken into account in any payments made by the Enterprises to Developer pursuant to Section 15.6.1;

c. Developer's actual avoided costs of Work not being performed as a direct result of the occurrence of all such Relevant Events; and

d. the amount Developer is (or, pursuant to Section 35.5.a, should be) entitled to recover under any "delay in startup" coverage under the Available Insurance as a direct result of the occurrence of all such Relevant Events.

15.6.3. To the extent that the Reconciliation demonstrates that Developer was left in a worse position as determined pursuant to Section 28.2 notwithstanding the payments made to Developer by the Enterprises pursuant to Section 15.6.1, the Enterprises shall, through one, or any combination, of the following methods as determined in the Enterprises' discretion (subject to Section 15.5):

a. make a lump sum payment to Developer within 45 Calendar Days after completion of the Reconciliation; or

b. notify Developer of an adjustment to the "Base CPP" set out in Section 2(f) of Part 2 of Schedule 6 (*Performance Mechanism*), which adjustment shall take effect from the date specified in such notice,

in either case in a manner that would result in Developer being left in a No Better and No Worse position after taking into account the Reconciliation.

15.6.4. To the extent that the Reconciliation demonstrates that Developer was left in a better position as determined pursuant to Section 28.2 as a result of the payments made to Developer by the Enterprises pursuant to Section 15.6.1, Developer and the Enterprises shall, as applicable, through one, or any combination, of the following methods as determined in the Enterprises' discretion:

a. with respect to Developer, make a lump sum payment to the Enterprises within 30 Calendar Days after completion of the Reconciliation; or

b. with respect to the Enterprises, notify Developer of an adjustment to the "Base CPP" set out in Section 2(f) of Part 2 of Schedule 6 (*Performance Mechanism*), which adjustment shall take effect from the date specified in such notice,

c. with respect to the Enterprises, by way of set-off pursuant to Section 5 of Part 3 of Schedule 4 (*Payments*) against amounts otherwise payable by the Enterprises to Developer,

in each case in a manner that would result in Developer being left in a No Better and No Worse position after taking into account the Reconciliation.

15.7. Compensation Exclusions and Limitations

15.7.1. With respect to any Compensable Costs incurred by Developer in respect of any Relevant Event (other than any No-deductible Event, to which this Section 15.7.1 shall not apply) that occurs during the Construction Period, if the aggregate amount of such Compensable Costs directly resulting from the occurrence of such event is greater than (any such event, a "Compensable Construction Period Event"), then, subject to Section 15.7.3, the Enterprises shall compensate Developer (as applicable):

a. with respect to the occurrence of all Compensable Construction Period Events (other than such events that are subject to Sections 15.7.1.b, 15.7.1.c or 15.7.1.d), for the amount by which the aggregate amount of Compensable Costs directly resulting from the occurrence of all such events is greater than ;

b. with respect to all Unexpected Utility Condition Events that are Compensable Construction Period Events, for the aggregate amount of Compensable Costs directly resulting from the occurrence of all such events as follows:

i. 50% of the first of such aggregate amount of Compensable Costs (while, for certainty, Developer shall bear the remaining 50% of such costs); and

ii. 100% of any and all such aggregate amount of Compensable Costs in excess of such first of such aggregate amount; and

c. with respect to all Non-Appendix B Parcel Unexpected Hazardous Substances Events that are Compensable Construction Period Events, for the aggregate amount of Compensable Costs directly resulting from the occurrence of all such events as follows:

i. 50% of the first of such aggregate amount of Compensable Costs (while, for certainty, Developer shall bear the remaining 50% of such costs); and

ii. 100% of any and all such aggregate amount of Compensable Costs in excess of such first of such aggregate amount; and

d. with respect to all Appendix B Parcel Unexpected Hazardous Substances Events that are (or, as the case may be, to the extent they are) Compensable Construction Period Events, for the aggregate amount of Compensable Costs directly resulting from the occurrence of all such events as follows:

i. none of the first of all Appendix B Parcel Costs; and

ii. 100% of any and all such aggregate amount of Compensable Costs that are:

A. incurred as a direct result of the occurrence of all Appendix B Parcel Unexpected Hazardous Substances Events that are (or, as the case may be, to the extent that they are) Compensable Construction Period Events; and

B. in excess of the dollar amount specified in Section 15.7.1.d, where, for purposes of this Section 15.7.1.d.ii, Change in Costs as a component of such aggregate amount of Compensable Costs shall be determined in accordance with paragraph a. of the definition thereof in Part A of Annex A (*Definitions and Abbreviations*) (and not paragraph b. of such definition)).

15.7.2. With respect to any otherwise Compensable Costs incurred by Developer in respect of any Relevant Event (other than any No-deductible Event, to which this Section 15.7.2 shall not apply) that occurs during the Operating Period, if the aggregate amount of such Compensable Costs directly resulting from the occurrence of such event is greater than (indexed), then, subject to Section 15.7.3, the Enterprises shall compensate Developer, with respect to the occurrence of all such events, for the amount by which the aggregate amount of such Compensable Costs directly resulting from the occurrence of all such events in any given Contract Year is greater than (indexed).

15.7.3. With respect to any Change in Costs (excluding any such costs as described in paragraph a.viii. of the definition thereof in Part A of Annex A (*Definitions and Abbreviations*)) incurred by Developer as a result of the occurrence of a Compensation Event as described in paragraph f.vi. of the definition thereof in Part A of Annex A (*Definitions and Abbreviations*):

a. the Enterprises shall, following consultation with Developer, use Reasonable Efforts to assert a Claim against the relevant Utility Owner in respect of the Losses incurred by Developer as a result of the occurrence of any such Compensation Event which Losses constitute Change in Costs to which this Section 15.7.3 applies;

b. Developer's rights under Sections 15.3.1.d, 15.4, 15.7.1 and 15.7.2 to be compensated with respect to any and all Change in Costs to which this Section 15.7.3 applies shall (subject to Section 15.7.3.c) be limited to the amount of such Change in Costs (if any) that the Enterprises recover from the relevant Utility Owner;

c. the Enterprises shall be entitled to be reimbursed by Developer for the reasonable cost and expense of pursuing any Claim against a Utility Owner pursuant to Section 15.7.3.a (whether or not the Enterprises make any recovery from the relevant Utility Owner as a result of making such Claim), including by deducting the amount thereof from any amount

otherwise payable to the Developer under this Agreement including as contemplated by Section 15.7.3.b; and

d. provided that the Enterprises have complied with their obligations under Section 15.7.3.a, Developer:

i. agrees to be bound by the outcome of the Enterprises' use of Reasonable Efforts to assert a Claim pursuant to Section 15.7.3.a in connection with the occurrence of any such Compensation Event; and

ii. hereby waives any right that it may have to recover from the Enterprises any Change in Costs to which this Section 15.7.3 applies to the extent that any such Change in Costs that it has incurred as a result of the occurrence of any such Compensation Event exceed the amount recovered by it pursuant to Sections 15.7.3.b and 15.7.3.c,

provided that, for certainty, this Section 15.7.3:

e. shall not apply to any:

i. Change in Costs as described in paragraph a.viii. of the definition thereof in Part A of Annex A (*Definitions and Abbreviations*);

ii. Milestone Payment Delay Costs; or

iii. Delay Financing Costs,

in any such case arising as a result of any such Compensation Event; and

f. is without prejudice to Developer's rights under any other provision of this Section 15 to be compensated for costs referenced in Sections 15.7.3.e.i, 15.7.3.e.ii and 15.7.3.e.iii.

15.8. Special Provisions for Force Majeure Events

15.8.1. Following the occurrence of a Force Majeure Event:

a. Developer, if an Affected Party with respect to such Force Majeure Event, shall promptly notify the Enterprises of the Force Majeure Event pursuant to Sections 15.1 and 15.2.2.a; and

b. the Enterprises, if Affected Parties with respect to such Force Majeure Event, shall promptly notify Developer of the Force Majeure Event, including the date of its commencement, evidence of its effect on the obligations of the Affected Party and any action proposed to mitigate its effect.

15.8.2. Whether or not any notice has been given pursuant to Section 15.8.1:

a. Developer, if an Affected Party, shall comply with Sections 15.1 and 15.2.2.a with respect to the treatment of the relevant Force Majeure Event as a Relief Event pursuant to Section 15.3; and

b. the Enterprises, if an Affected Party, may require Developer to consult with them in good faith, and to use all Reasonable Efforts, to agree on appropriate terms to mitigate the effects of the relevant Force Majeure Event and facilitate the continued performance of this Agreement.

15.8.3. To the extent either of the Enterprises is an Affected Party, the Enterprises shall be relieved from the performance of their affected obligations under this Agreement (and shall not incur liability to Developer for Losses in connection with a Force Majeure Event), provided that, notwithstanding the foregoing, the Enterprises shall not be excused from timely payment of any monetary obligations under this Agreement due to the occurrence of any Force Majeure Event.

PART E: KEY PERSONNEL, SUBCONTRACTORS AND WORKFORCE

16. PERSONNEL

16.1. Developer's Key Personnel Obligations

Subject to Section 16.2, Developer shall ensure that all Key Personnel are at all relevant times (as determined by reference to the periods set out in Schedule 27 (*Key Personnel*)):

a. seconded to or employed by such Person; and

b. occupying the role and performing the function of their position,

in each case as required by or set out in such Schedule and any other relevant provisions of this Agreement.

16.2. Removal or Replacement of Key Personnel

16.2.1. Developer shall not remove and/or replace any of the Key Personnel without the Enterprises' prior Approval, provided that Developer may, as required by Law or pursuant to Good Industry Practice, terminate, suspend or limit the duties of any Key Personnel individual (and, promptly thereafter, notify the Enterprises of such action).

16.2.2. If for any reason Developer wishes to remove and/or replace any Key Personnel and such removal and/or replacement requires the Enterprises' Approval under Section 16.2.1, Developer shall promptly deliver a notice to the Enterprises for Approval, setting out the reason for such removal and/or replacement, together with:

a. the identity, expertise and experience of the proposed replacement; and

b. any such support information or evidence as the Enterprises may reasonably require in relation to such matters.

16.3. Developer's Personnel Qualifications

Developer shall ensure that all Work shall be performed and, as applicable, supervised by personnel:

a. who are careful, skilled, experienced and competent in their respective trades or professions;

b. who are professionally qualified to, and who hold all necessary registrations, permits, approvals and licenses to, perform or supervise the relevant part Work pursuant to this Agreement; and

c. who shall assume professional responsibility for the accuracy and completeness of the relevant part Work performed or supervised by them.

17. SUBCONTRACTING REQUIREMENTS

17.1. Subcontracting Terms and Requirements

17.1.1. Each Subcontract, and any amendments or supplements thereto, shall comply with, and, as applicable, incorporate the terms set out in, Part A of Schedule 16 (*Mandatory Terms*).

17.1.2. Without prejudice to Section 17.1.3, the Parties acknowledge and agree that:

a. Developer has entered into a Construction Contract dated as of the Agreement Date with Kiewit Infrastructure Co. and an O&M Contract dated as of the Agreement Date with Roy Jorgensen Associates, Inc., and the Enterprises hereby confirm that they Accept the terms of such contracts pursuant to Section 17.1.3.b.i;

b. as of and with effect from the Agreement Date:

i. Kiewit Infrastructure Co. is the Construction Contractor;

ii. Roy Jorgensen Associates, Inc. is, subject to Section 17.1.2.c and Section 17.1.2.e, the O&M Contractor;

iii. Kiewit Infrastructure Group Inc. is the Guarantor with respect to the Construction Contract and there is no Guarantor with respect to the O&M Contract; and

iv. neither Roy Jorgensen Associates, Inc. nor Kiewit Infrastructure Group Inc. is a joint venture of which there are separate members;

c. for purposes of the definitions of O&M Contract and of O&M Contractor set out in Part A of Annex A (*Definitions and Abbreviations*), and subject to Section 17.1.2.e, as of and with effect from the Agreement Date, Developer shall be considered to be self-performing:

i. all Handback Work; and

ii. such part of the Renewal Work that is not allocated to Roy Jorgensen Associates, Inc. as O&M Contractor in accordance with the "Scope of Services" as defined in the O&M Contract in effect on the Agreement Date,

and the Enterprises hereby confirm that they Accept Developer's self-performance of such elements of the Work pursuant to Section 17.1.3.b.iii;

d. Developer may only enter into replacements to the Accepted Principal Subcontracts referred to in Section 17.1.2.a, or any new Principal Subcontract, pursuant to this Section 17; and

e. after the expiration (but not early termination for breach or default) of the O&M Contract previously Accepted pursuant to Section 17.1.2.a, for purposes of the definitions of O&M Contract and of O&M Contractor set out in Part A of Annex A (*Definitions and Abbreviations*), as of and with effect from the expiration date of such O&M Contract (the "Initial O&M Contract Expiration Date"), Developer shall be considered to be self-performing such portion of the O&M Work:

i. that was previously performed by Roy Jorgensen Associates, Inc. as the O&M Contractor under the terms of such O&M Contract; and

ii. which is not otherwise to be performed under a separate third-party Principal Subcontract,

without the requirement for an Acceptance by the Enterprises pursuant to Section 17.1.3.b.iii, provided that as a condition to the foregoing:

iii. 18 months prior to the Initial O&M Contract Expiration Date and every 6 months thereafter until such date, and otherwise at such other times within such 18 month period as the Enterprises may reasonably require, Developer shall meet with the Enterprises to discuss the transition to self-performance of such portion of the O&M Work by the Developer and consequential updates to the MMP and OMP to be made and Accepted in accordance with Section 5.1.3 of Schedule 11 (*Operations and Maintenance Requirements*) and Section 9.1.2 of Schedule 11 (*Operations and Maintenance Requirements*) prior to the Initial O&M Contract Expiration Date;

iv. prior to the initial meeting referred to in Section 17.1.2.e.iii, and otherwise upon the reasonable request of the Enterprises, Developer shall deliver the following (or, as applicable, updates thereto) to the Enterprises:

A. a draft organizational chart and staffing plan that shows the personnel including the O&M Manager required for all maintenance activities required in Schedule 11 (*Operations and Maintenance Requirements*);

B. details of the technical and financial resources available to Developer to fulfill its obligations in self-performing such portion of the O&M Work, including the names, qualifications, experience and/or technical or other professional competence of its proposed Subcontractors and any personnel referenced in the staffing plan referenced in Section 17.1.2.e.iv.A;

C. the location and layout of maintenance and storage facilities, vehicles and equipment, tools, computers, software and other major assets/items to be used by Developer in connection with the performance of the O&M Work;

D. drafts of Contractor Bonds required to be provided by the Developer in accordance with Sections 9.3 and 17.1.2.e.v.A;

E. a schedule of the insurance to be provided by the Developer in accordance with Sections 17.1.2.e.v.B and 25.1; and

F. a draft transition plan with respect to the MMIS required by Section 7 of Schedule 11 (*Operations and Maintenance Requirements*); and

v. as of the Initial O&M Contract Expiration Date:

A. Developer shall have delivered to the Enterprises the Contractor Bonds as then required pursuant to Section 9.3.1.a.ii;

B. with respect to all Insurance Policies that are required pursuant to Section 25 and Schedule 13 (*Required Insurance*) to be in effect on and from such date:

I. such policies have been obtained from Eligible Insurers on terms that comply with Section 25 and Schedule 13 (*Required Insurance*) and are in full force and effect; and

II. the Enterprises shall have received binding verifications of coverage from the relevant insurers (or Developer's insurance brokers) of such Insurance Policies, in compliance with Section 25.3.1 as Accepted by the Enterprises;

C. Developer shall have submitted and received prior to such date Acceptance, Approval or other consent, approval or like assent, as applicable, of or to each other Deliverable which is required by the terms of this Agreement to be submitted in advance of such date and of such transition to self-performance;

D. no Developer Default has occurred and is continuing, the Increased Oversight Threshold has not been met or exceeded and no Initial Warning Notice has been served and remains in effect; and

E. Developer has certified to the Enterprises that it has no reason to believe that either (I) it shall be unable to self-perform such O&M Work as of and with effect from the Initial O&M Contract Expiration Date in accordance with this Agreement or (II) such self-performance will have an adverse impact on the continuing performance by Developer of its obligations under this Agreement or on the Project.

17.1.3. Without prejudice to Section 33.3, Developer shall not:

a. subject to Section 17.1.3.c, without prior notice to the Enterprises, amend, or waive any provision of, any Principal Subcontract, other than to the extent necessary to reflect a corresponding amendment to, or Change under, this Agreement;

b. without the prior Acceptance of the Enterprises, subject to Section 17.1.3.c.i:

i. enter into any Principal Subcontract unless previously Accepted pursuant to this provision or confirmed as Accepted in Section 17.1.2.a;

ii. enter into any agreement replacing all or part of any Principal Subcontract, excluding, for certainty, an extension of the O&M Contract previously Accepted pursuant to Section 17.1.2.a in the same or substantially similar form and substance for a period following the Initial O&M Contract Expiration Date; or

iii. self-perform any part of the Work, including in replacement of all or part of any Principal Subcontract unless such self-performance has been previously Accepted pursuant to this provision or confirmed as Accepted in Section 17.1.2.c or otherwise does not require Acceptance pursuant to Section 17.1.2.e,

provided that, if applicable and required by the Enterprises as a condition of such Acceptance, Developer simultaneously executes and delivers (and ensures that the relevant Principal Subcontractor executes and delivers) to the Enterprises for counter-signature a Principal Subcontractor Direct Agreement; or

c. without the prior Approval of the Enterprises:

i. enter into any agreement, amendment or waiver materially and adversely affecting the performance of any Principal Subcontract, other than to the extent necessary to reflect a corresponding amendment to, or Change under, this Agreement;

ii. terminate, or permit or suffer any termination of, any Principal Subcontract (in whole or in material part), other than in conjunction with the Enterprises' Acceptance of either a replacement of such Principal Subcontract or Developer's self-performance of any relevant part of the Work, in either case in accordance with Section 17.1.3.b; or

iii. assign or transfer any of its, or permit or suffer any assignment or transfer by a Principal Subcontractor of any of such Principal Subcontractor's, rights and/or obligations under any Principal Subcontract (in whole or in material part), other than pursuant to any related Lenders' Subcontract Direct Agreement (as such term is defined in the relevant Principal Subcontractor Direct Agreement); or

iv. in any material respect, fail to perform, depart from its obligations, fail to enforce or waive or allow to lapse any rights it may have (or procure that others in any material respect either fail to perform, depart from their obligations, fail to enforce or waive or allow to lapse any rights they may have) under any Principal Subcontract, except to the extent that any such action or failure to act by Developer shall have no material adverse impact on:

A. the performance by Developer of its obligations under this Agreement; or

B. the rights of the Enterprises under this Agreement or under any Principal Subcontractor Direct Agreement.

17.1.4. Developer shall deliver to the Enterprises a copy of:

a. any amendment or replacement of any Principal Subcontract promptly following execution of the same; and

b. each Subcontract other than a Principal Subcontract (and any amendment to any such Subcontract) promptly and in any event no later than 30 Calendar Days after execution of such Subcontract (or amendment).

17.2. Self-Performance

a. Developer shall ensure that the Construction Contractor self-performs at least 30% of the value of the Construction Work as measured by the amounts payable under the terms of the Construction Contract with respect to such Construction Work (excluding, for certainty, any amounts payable with respect to the O&M Work During Construction).

b. For purposes of Section 17.2.a, the Construction Contractor shall be considered to be a "design-builder" as described in 23 CFR § 635.116(d)(2).

17.3. Subcontracting with Affiliates

a. Without limiting its obligations under Sections 17.1 and 17.2, Developer shall have the right to have Work directly or indirectly performed by Affiliates of itself or any of its Equity Members (including any Affiliate that may be a Principal Subcontractor or other Subcontractor as identified in the Preferred Proposer's Proposal) only if the following conditions are satisfied:

i. the Affiliate shall be qualified, experienced and capable in the performance of such part of the Work assigned;

ii. Developer shall execute, or have a Subcontractor execute, a written Subcontract with the Affiliate;

iii. such Subcontract shall be subject to the Enterprises' Acceptance, and:

A. be on terms consistent with this Agreement and Good Industry Practice;

B. be on terms no less favorable to Developer (or, as applicable, its Subcontractor) than those that Developer (or such Subcontractor) could reasonably obtain in an arms' length, competitive transaction with an unaffiliated Subcontractor;

C. be in form and substance similar to Subcontracts then being used by Developer or its Subcontractors, as applicable, for similar work or services with unaffiliated Subcontractors; and

D. set out the scope of work and services thereunder and all the pricing, terms and conditions in relation to such scope of work and services.

b. Developer shall make no payments to Affiliates for work or services in advance of provision of such work or services under the terms of a Subcontract that complies with Section 17.3.a, except for reasonable mobilization payments or other payments consistent with arm's length, competitive transactions of similar scope.

17.4. Relationship with Subcontractors

a. Pursuant to Section 8.2, the retention of any Subcontractor (of any tier) by Developer in accordance with this Agreement shall not:

i. relieve Developer of its obligations and liabilities, or deprive Developer of any rights, in each case under this Agreement; and

ii. relieve the Enterprises of or increase their obligations and liabilities, or deprive the Enterprises of any rights, in each case under this Agreement.

b. The Enterprises acknowledge and agree that:

i. the Principal Subcontracts may provide that the Principal Subcontractors may claim relief from Developer only if and to the extent that such claim or relief is granted to Developer under this Agreement; and

ii. Developer will not be precluded from advancing any claim or seeking any relief under this Agreement solely by reason that Developer is not liable to a Principal Subcontractor under a Principal Subcontract until and/or only to the extent that such claim or relief is granted by the Enterprises to Developer under this Agreement,

provided that all such claims shall be made and administered by Developer, and nothing in this Section creates any contract or obligation directly between or among the Enterprises and any Principal Subcontractor or gives any Principal Subcontractor any rights against the Enterprises.

17.5. Prompt Payment of Subcontractors

17.5.1. Developer shall, and shall ensure that each of its Subcontractors and each of their respective Subcontractors shall, pay each of its and their respective Subcontractors (excluding only any Principal Subcontractor as payee) an amount equal to:

a. 100% of the calculated value of the completed work or the services provided under the relevant Subcontract through and including the last day of the most recently concluded month; *less*

b. any amounts previously paid in respect of such completed work or provided services; *less*

c. any amount that is subject to retainage as permitted by Section 17.5.4; *less*

d. any amount that is subject to a good faith dispute presented in accordance with the terms of the relevant Subcontract,

promptly, which for purposes of this Section 17.5.1 means no later than:

e. with respect to:

i. Developer as payor of any Subcontractor that is not a Principal Subcontractor; or

ii. any Principal Subcontractor as payor,

30 Calendar Days following the relevant payee Subcontractor's delivery of an invoice to the relevant payor in compliance with Section 2.(c) of Part A of Schedule 16 (*Mandatory Terms*) in respect of such amount as determined pursuant to Sections 17.5.1.a through 17.5.1.d and in accordance with the terms of the relevant Subcontract; and

f. with respect to any Subcontractor (that is not a Principal Subcontractor) as payor, seven Calendar Days following such payor Subcontractor's receipt of a corresponding payment in respect of the relevant work or services, as applicable.

17.5.2. Developer may request Approval for any payee Subcontractor that is not a Principal Subcontractor to be exempt from being paid promptly as provided for in Section 17.5.1. Following the Approval of any such exemption, Section 17.5.1.e (and not Section 17.5.1.f) shall apply to the exempted Subcontractor as a payor Subcontractor as if such exempted Subcontractor was a Principal Subcontractor (except to the extent that any of such exempted Subcontractor's payee Subcontractors are also subject to such an Approved exemption under this Section 17.5.2).

17.5.3. Notwithstanding the provisions of Section 17.5.1 and 17.5.2, Developer shall pay each of its direct Subcontractors (including any Principal Subcontractor as payee) in accordance with 49 CFR § 26.29 no later than 30 Calendar Days following payment from the Enterprises to the Developer of any Milestone Payment, Performance Payment or other payment under this

Agreement to the extent that part of such payment is required under the terms of the relevant Subcontract to be used to pay such Subcontractor the relevant amount.

17.5.4. Developer shall, and shall ensure that each of its direct Subcontractors and each of their respective Subcontractors shall, be permitted (but not, for certainty, required) to withhold retainage from payments otherwise due to a payee Subcontractor, provided that:

a. excluding with respect to payments to be made to (i) any Principal Subcontractor or (ii) any other Subcontractor (subject to the Enterprises' prior Approval), such retainage shall not exceed 5% of the calculated value of the completed work or services provided from time to time; and

b. all such retainage shall be paid in full no later than 30 Calendar Days after the work or services performed under the relevant Subcontract is or are satisfactorily completed.

PART F: PROJECT MANAGEMENT

18. DELEGATION OF AUTHORITY

18.1. Delegations Among Enterprises and to CDOT

18.1.1. While, for ease of reference, HPTE and BE are collectively referred to herein as the Enterprises, either one of them may in their discretion act or perform for both of them in their capacity as Enterprises under this Agreement, and Developer shall accept such action or performance as discharging the relevant obligation(s) of both Enterprises, except where this Agreement expressly refers to BE acting as PABs Issuer, and not to an Enterprise or the Enterprises.

18.1.2. Subject to compliance with Law, and without relieving the Enterprises of any obligation hereunder, either Enterprise may also in its discretion delegate the exercise of any right or the performance of any obligation under this Agreement to CDOT.

18.2. Use of Representatives

18.2.1. Appointment of Representatives

a. Pursuant to this Section 18.2.1, Developer and the Enterprises shall each identify and maintain a person as its and their official representative (respectively, the "Developer's Representative" and the "Enterprise Representative" and, together, the "Representatives" and each a "Representative") with the functions and powers as set out in Section 18.2.2.

b. The Developer's Representative shall at all times be its "Project Manager", initially as identified in Schedule 27 (*Key Personnel*), subject to replacement pursuant to Section 16.2. The Enterprise Representative shall initially be their "Project Director" as notified to Developer on or prior to the Agreement Date, subject to replacement pursuant to this Section 18.2.1.

c. From time to time:

i. the Enterprises may replace their Representative; and

ii. Developer and the Enterprises may each delegate all or part its or their Representative's responsibilities under this Agreement,

in either case by notice to the other Party containing:

iii. the name, title, mailing address, principal phone numbers, email address (or digital equivalent) and fax number (if any) of the replacement Representative or delegatee;

iv. in the case of partial delegations of authority, a schedule setting out the extent to which authority for managing any aspect of this Agreement has been delegated and to whom; and

v. in the case of time-limited replacements or delegations, the start and end date for such time-limited replacement or delegation.

18.2.2. Power and authority of Developer Representatives

a. Except as previously notified by Developer to the Enterprises before any relevant act or instruction occurs or is given:

i. the Enterprises shall be entitled to assume that Developer's Representative has, and Developer shall (subject to reasonable exceptions and limitations to be notified to the Enterprises) ensure that Developer's Representative shall have, full authority to act on behalf of Developer for all purposes of this Agreement; and

ii. subject to any exceptions or limitations previously notified to them, the Enterprises and the Enterprise Representative shall be entitled to treat any act of Developer's Representative in connection with this Agreement as being

expressly authorized by Developer and the Enterprises and the Enterprise Representative shall not be required to determine whether any express authority has in fact been given.

b. Any relevant instruction to be given by either party shall be given in accordance with Section 49.1.1.

18.2.3. Power and authority of Enterprise Representative

Except as previously notified by the Enterprises to Developer before any relevant act or instruction occurs or is given:

a. Developer shall only be entitled to assume that the Enterprise Representative has the functions and powers of the Enterprises (collectively, and pursuant to this Agreement where necessary or permissible, individually) in relation to the Project that are identified in this Agreement as functions or powers to be carried out by the Enterprise Representative; and

b. Developer and Developer's Representative:

i. shall be entitled to treat any written action or instruction by the Enterprise Representative that is authorized by this Agreement as being expressly authorized by the Enterprises (collectively, and pursuant to this Agreement where necessary or permissible, individually) and Developer and Developer's Representative shall not be required to determine whether any express authority has in fact been given; and

ii. shall not be entitled to treat any other act or instruction by any other officer, employee or other Person engaged by the Enterprises or CDOT, unless otherwise expressly authorized pursuant to this Agreement, as being authorized by the Enterprises, and upon receiving any such presumptively unauthorized act or instruction from any Person, Developer shall:

A. promptly submit a written request to the Enterprises requesting clarification whether and to what extent authority has in fact been given to the relevant Person; and

B. pending the Enterprises' response, refrain from taking any related action to the extent reasonable under the circumstances.

PART G: PUBLIC OVERSIGHT

19. RECORD KEEPING AND OVERSIGHT

19.1. Project Records

19.1.1. General obligation to maintain Project Records

Developer shall (and shall require that each of its Subcontractors and each of their respective Subcontractors shall) at all times create and maintain full and complete records, books, documents, papers, databases, files and other documentation of information relating to the Project and, as applicable, Developer's performance of its obligations under this Agreement and the Principal Subcontracts and each Subcontractor's performance under the Subcontracts to which it is a party, including:

a. as required by Law, including CORA to the extent it is applicable to Project Records in the custody of Developer-Related Entities as a matter of Law;

b. pursuant to Good Industry Practice;

c. pursuant to GAAP, as applicable;

d. as otherwise required by the provisions of this Agreement other than this Section 19.1.1, including pursuant to Section 13 of Schedule 8 (*Project Administration*); and

e. maintenance of copies of:

i. all Principal Subcontracts (and all amendments and waivers thereto) and, with respect to each Subcontractor's records, of each Subcontract to which it is a party (and all amendments and waivers thereto); and

ii. all notices, correspondence, submissions, change, purchase or work orders, or other documents and materials expressly referenced as work product in this Agreement, any Principal Subcontract and, with respect to each Subcontractor's records, each Subcontract to which it is a party,

together, the "Project Records".

19.1.2. Standards for maintenance of Project Records

Developer shall (and shall ensure that each of its Subcontractors and each of their respective Subcontractors shall):

a. create and maintain Project Records in the format or formats (hardcopy, analog, digital or otherwise) determined from time to time by reference to the requirements and standards set out in Sections 19.1.1.a through 19.1.1.e;

b. maintain originals or copies of all Project Records that are otherwise required to be maintained in a physical format at a location in the State; and

c. develop and maintain procedures to backup and secure all Project Records that, at a minimum, comply with Law and Good Industry Practice.

19.1.3. Inspection of Project Records

Developer shall, without charge:

a. make all its Project Records available for inspection by the Enterprises, CDOT or any of their representatives or designees (each, an "Inspecting Party") pursuant to this Section 19.1.3;

b. make its Project Records available for inspection by the Inspecting Parties at its principal offices in the State, or at such other facilities as the Enterprises may reasonably require on behalf of themselves or any other Inspecting Party to the extent records are maintained at such other facilities:

i. during normal business hours (and, upon reasonable request, at times outside normal business hours); and

ii. upon reasonable notice, unless the Enterprises have a good faith suspicion of fraud in which case no prior notice shall be required;

c. allow any Inspecting Party to make extracts and take notes during any inspection and, upon request, furnish copies of Project Records to any Inspecting Party; and

d. subject to its obligations to comply with Section 19.1.2.c, and without limiting its obligations pursuant to Schedule 8 (*Project Administration*), prior to issuance of NTP2 Developer shall submit to the Enterprises for Acceptance, and have received Acceptance of, a written protocol with respect to making all Project Records maintained in digital formats available for real-time, "24/7" secure remote access by the Inspecting Parties to the extent reasonably practicable. Developer shall thereafter comply with such protocol.

19.1.4. Subcontractor Project Records

a. Developer shall ensure that each of its Subcontractors and each of their respective Subcontractors shall, either directly or through Developer and in either case without charge, make its Project Records available to the Inspecting Parties for inspection on terms equivalent to those set out in Section 19.1.3.a to 19.1.3.c.

b. To the extent any Project Records are in the exclusive possession of a Subcontractor that fails to make such records available pursuant to Section 19.1.4.a, Developer shall notify the Enterprises of such occurrence, identify the Project Records that are unavailable, and describe what efforts Developer has made to secure compliance or otherwise obtain such Project Records.

19.1.5. Limitations on disclosure

Notwithstanding anything to the contrary contained in this Agreement:

a. Developer shall not be required to disclose, or to ensure the disclosure by any of its Subcontractors and/or of their respective Subcontractors of, any Project Records protected by attorney-client or other legal privilege or protection under Law based upon an opinion of counsel (such counsel to be Acceptable to the Enterprises) unless such disclosure is otherwise compelled by Law; and

b. to the extent permitted by Law, the Parties agree that the Financial Model and any Project Intellectual Property that is subject to an Intellectual Property Escrow shall at all times be treated by the Parties as proprietary and confidential commercial non-public information which may only be reviewed by and accessed by the Enterprises pursuant to this Agreement and, as applicable, the Financial Model Escrow Agreement or the relevant Intellectual Property Escrow.

19.1.6. Retention of Project Records

a. Each individual Project Record shall be retained for a period of at least seven years after such Project Record is first generated, or for such longer period as may be required pursuant to Sections 19.1.1.a through 19.1.1.e or Section 19.1.6.b.

b. Notwithstanding Section 19.1.6.a, Developer shall (and shall ensure that each of its Subcontractors and each of their respective Subcontractors shall) retain and make available pursuant to this Section 19.1 all Project Records:

i. that relate to a Claim or Dispute until any later date that such matters are Agreed or Determined; and

ii. in existence on the last Calendar Day of the Term (or the equivalent under any Subcontract) until the later of the seventh anniversary of such day and any date as may be required pursuant to Sections 19.1.1.a through 19.1.1.e.

19.1.7. Survival of obligations

Developer's obligations under this Section 19.1 shall survive until the later of:

a. the seventh anniversary of the Expiry Date (or, if applicable, the Termination Date); and

b. with respect to the retention of any Project Record, such date as determined pursuant to Section 19.1.6.

19.2. Financial Statements

In addition to all Developer's other obligations to prepare and deliver reports and other materials under this Agreement, Developer shall provide the Enterprises with copies of the following:

a. its unaudited quarterly and annual accounts within 20 Working Days after such accounts have been finalized; and

b. its audited annual accounts within 20 Working Days after publication (or, if not published, after such accounts have been finalized),

each of which may be subject to redactions made in compliance with Section 20 and may be subsequently made available to the public pursuant to CORA.

19.3. Enterprise Board Meeting Attendance

Developer shall appear before and make a separate presentation to each Enterprise's board and the Transportation Commission as and when required by the Enterprises (subject to reasonable prior notice), and, in the case of the boards of the Enterprises, no less frequently than:

a. during the Construction Period, once in each month with respect to each Enterprise board; and

b. during the Operating Period, once in each month with respect to the HPTE board only,

for the purpose of informing such bodies about the Project and the Work in connection with their public oversight of the same.

20. COLORADO OPEN RECORDS ACT

20.1.1. Notwithstanding anything to the contrary contained in this Agreement, Developer acknowledges and agrees that this Agreement, except as provided for in Section 19.1.5, shall not be treated as CORA Exempt Materials and may be disclosed by the Enterprises without restriction.

20.1.2. Prior to issuance of NTP1, Developer shall submit to the Enterprises for, and have received, Acceptance of a written protocol for the disclosure and, as applicable, exemption from disclosure of Project Records in compliance with CORA and other Laws applicable to the disclosure of such Project Records. Such protocol shall include provisions to address disclosure and sharing of Project Records among Developer-Related Entities and with any of their Lenders, regulators or rating agencies, in each case in the ordinary course of business and in connection with the Project. Developer shall (and shall ensure that each Developer-Related Entity shall) comply with any such Accepted protocol.

20.1.3. Neither the Enterprises nor CDOT shall be responsible or liable to Developer or any other Person for the disclosure of any Project Records if the disclosure:

a. is required by Law;

b. subject to Section 19.1.5 (and excluding, for certainty, any disclosure of CORA Exempt Materials) is permitted by Law;

c. is required by court order;

d. occurs through inadvertence or mistake;

e. is made to the FHWA or the US DOT; or

f. is compliant with the protocol Accepted pursuant to Section 20.1.2.

20.1.4. In the event the Enterprises or CDOT receives a CORA request for Project Records that are in the custody and control of Developer-Related Entities, Developer shall cooperate with the Enterprises, CDOT and, as applicable, the State's Attorney General's office, and shall cause all Subcontractors and each of their respective Subcontractors to cooperate, in responding to such request in a timely manner under CORA or otherwise in accordance with the protocol Accepted pursuant to Section 20.1.2.

20.1.5. Developer shall be responsible for all costs associated with defending any request for disclosure of any Project Records claimed by Developer to be exempt from disclosure under CORA, whether such records are in the custody of Developer (or any other Developer-Related Entity), the Enterprises or CDOT. In connection with this obligation, Developer shall:

a. use Reasonable Efforts to assist the Enterprises (and to secure the assistance of the Enterprises by each of Developer's Subcontractors and of each of their Subcontractors) in such defense;

b. pursuant to Section 24.2, indemnify the Enterprises for any Losses incurred or suffered by them in such defense; and

c. at the request of the Enterprises or the State Attorney General's office, intervene in any such defense at its own cost and with its own counsel.

20.1.6. Developer shall not (and shall ensure that each of its Subcontractors and each of their respective Subcontractors shall not) disclose any Project Records to any Person, other than:

a. as expressly permitted by this Agreement;

b. as required by Law or a court order;

c. in compliance with the protocol Accepted pursuant to Section 20.1.2 or, prior to Acceptance of such protocol, among Developer-Related Entities, their Lenders, regulators and rating agencies, in the ordinary course of business in connection with the Project and subject to customary safeguards regarding the confidential treatment of such records; or

d. with the Enterprises' prior Approval,

and, in each case, where such information relates to a member of the public, Developer shall not disclose or make use of any such information otherwise than for the purpose for which it was provided and then only in compliance with Law, unless Developer has obtained the prior written consent of such Person and of the Enterprises.

21. INSPECTIONS AND AUDITS

21.1. Site Inspections and Annual Survey and Audit Rights

21.1.1. Inspections of the Site

a. Subject to Section 21.1.1.b, the Enterprises, CDOT, the FHWA and their respective authorized agents shall have an unrestricted right to enter the Site from time to time in order to:

i. inspect the state and progress of the Work and to monitor compliance by Developer with its obligations under this Agreement, including by conducting inspections, surveys, sampling, measurements, observations, testing and other reasonably necessary oversight activities;

ii. conduct routine, in-depth or any other type of inspection or other oversight activity in accordance with their standard practices; and/or

iii. any other inspection or oversight activity expressly contemplated by this Agreement,

provided that any such activities are conducted pursuant to Section 21.1.3.

b. In exercising their rights under this Section 21.1.1, the Enterprises shall at all times comply with all relevant site rules and safety regulations in relation to the Site.

21.1.2. Annual Survey and Audit Rights

a. Once in every Calendar Year, and at additional times if the Enterprises reasonably believe that Developer is in breach of its obligations under this Agreement, the Enterprises may carry out or cause the carrying out of:

i. a survey of the Project and the Work (or part of the Project and the Work) by a suitably qualified independent expert (not being an employee or consultant of either Enterprise or CDOT that has otherwise been materially involved in the Project (except for purposes of conducting a prior survey)); and

ii. an audit of Project Records and Developer's compliance with its obligations under this Agreement.

b. The Enterprises shall notify Developer in writing a minimum of 10 Working Days in advance of the date they wish to carry out a survey or audit described in Section 21.1.2.a, provided that no such prior notice shall be required if the Enterprises reasonably believe that Developer is in breach of its obligations under this Agreement. Unless a Developer Default has occurred and is continuing, the Enterprises shall consider in good faith any reasonable request by Developer for the survey or audit to be carried out on a different date if such request is made at least five Working Days prior to the notified date and Developer (acting reasonably) is able to demonstrate that carrying out the survey on the notified date would materially prejudice Developer's ability to perform its obligations or exercise its rights under this Agreement. The survey and audit described in Section 21.1.2.a may be conducted separately during any relevant Calendar Year.

21.1.3. Rules governing conduct of inspections, surveys and audits

a. When carrying out any inspection, survey or audit pursuant to Section 21.1.1 or Section 21.1.2, the Enterprises shall use Reasonable Efforts to minimize any unnecessary disruption to the Work and Developer's performance of its obligations under this Agreement.

b. Subject to Sections 21.1.3.c and 21.1.4.a.iii, as between the Enterprises and Developer, the cost of the inspection, survey or audit conducted pursuant to Section 21.1.1 or Section 21.1.2 shall be borne by the Enterprises.

c. Developer shall, at its own cost and expense, use Reasonable Efforts to provide assistance to the Enterprises as required from time to time during the carrying out of any inspection, survey or audit conducted pursuant to this Section 21.

21.1.4. Findings of breach

a. If an inspection, survey or an audit conducted pursuant to Section 21.1.1 or Section 21.1.2 is conducted in response to or identifies any Developer breach or Developer Default, the Enterprises may, as applicable and in their discretion:

i. notify Developer of the condition which the Project and the Work (or any part of the Project and the Work) should be in to comply with Developer's obligations under this Agreement or, without altering Developer's obligations hereunder, of other steps the Enterprises believe should be taken with respect to Developer's obligations under this Agreement;

ii. without altering Developer's obligations hereunder, specify a reasonable period within which Developer must carry out any rectification and/or maintenance work, or where rectification or maintenance work cannot rectify the non-compliance, to

take reasonable steps to prevent the recurrence of such a non-compliance; and/or

iii. be entitled to be reimbursed by Developer for the reasonable cost and expense of the inspection, survey or audit and any costs and expenses incurred by the Enterprises in relation to such inspection, survey or audit (or, in the case of a breach that is not a Developer Default, such parts of the inspection, survey or audit that the Enterprises reasonably determine were necessary to identify such breach).

b. Notwithstanding any action by the Enterprises pursuant to Section 23.4, Developer shall promptly (or within such other period of time as is required or expressly permitted by Law and the provisions of this Agreement) rectify any non-compliance identified by any survey or audit conducted pursuant to this Section 21.1.

21.2. Right to Conduct Physically Intrusive Inspections

21.2.1. Without prejudice to the Enterprises' other rights under this Agreement, the Enterprises shall have the right, at any time prior to the Final Acceptance Date or prior to completion of any Renewal Work and, in either case, upon reasonable notice, to require Developer to permit physically intrusive inspections by the Enterprises of any part or parts of the Construction Work or Renewal Work, as applicable, including by opening up covered or sealed portions of the Work, when the Enterprises reasonably believe that such part or parts of the Construction Work or Renewal Work, as applicable, do not comply with the requirements of this Agreement. In carrying out any such inspection the Enterprises shall use Reasonable Efforts to minimize unnecessary disruption to the Work and Developer's performance of its obligations under this Agreement.

21.2.2. If, following the exercise by the Enterprises of their right pursuant to Section 21.2.1, an inspection shows that the relevant part or parts of the Construction Work or Renewal Work:

a. does not or do not comply with the requirements of this Agreement, then:

i. Developer shall rectify such noncompliance at its own cost and expense; and

ii. the Enterprises shall be entitled to be reimbursed by Developer for the reasonable cost and expense incurred by the Enterprises in relation to such inspection conducted pursuant to Section 21.2.1 (or, in the case of a noncompliance that is not a Developer Default, such parts of the inspection that the Enterprises reasonably determine were necessary to identify such noncompliance); and

b. complies or comply with the requirements of this Agreement, such inspection shall be treated as a Compensation Event, except to the extent that such inspection was carried out in response to Developer breaching its obligation to maintain Project Records pursuant to Section 19.1, which Project Records, if maintained in accordance with this Agreement, would have demonstrated that the relevant part or parts of the Construction Work or Renewal Work complied with the requirements of this Agreement.

21.2.3. Without prejudice to the rights of the Enterprises pursuant to this Section 21.2, the Parties acknowledge that the exercise of such rights pursuant to this Section 21.2 shall not in any way affect the obligations of Developer under this Agreement except as expressly set out in this Section 21.2 or elsewhere in this Agreement.

21.3. Increased Oversight

21.3.1. The Enterprises may, in their discretion, at any time when:

a. there are material Defects in the Work; or

b. Developer has materially failed to comply with the Technical Requirements (other than with respect to any breach that constitutes a Noncompliance Event) which failure remains uncured; and/or

c. the Increased Oversight Threshold has been met or exceeded,

without prejudice to any other right or remedy available to them, and without limiting Developer's other obligations under this Agreement (including obligations to remedy Defects and to otherwise perform in accordance with the requirements set out in this Agreement), by notice to Developer:

d. require Developer to promptly prepare and submit for Approval a remedial plan to, as applicable:

i. remedy such Defects or failure and prevent its recurrence; or

ii. improve performance so as to address the causes of the Increased Oversight Threshold being met or exceeded,

and, following Approval of such plan, Developer shall be required to comply with such plan; and/or

e. increase the level of their monitoring of Developer relative to the prior standard of practice under this Agreement prior to such Defect or failure, or to the Increased Oversight Threshold being met or exceeded, until such time as Developer shall have demonstrated to the reasonable satisfaction of the Enterprises that it is capable of performing and shall perform all its obligations under this Agreement.

21.3.2. If the Enterprises, in their discretion, issue a notice pursuant to Section 21.3.1, Developer shall bear its own costs and expenses and pay to the Enterprises on demand all reasonable costs and expenses incurred by or on behalf of the Enterprises in relation to any increased level of monitoring.

PART H: PERFORMANCE MANAGEMENT

22. PERFORMANCE-BASED PAYMENT DEDUCTIONS AND PERSISTENT BREACH

22.1. Performance-based Payment Deductions

22.1.1. Pursuant to Section 3(b) of Schedule 5 (*Milestone Payments*) and Part 1 of Schedule 6 (*Performance Mechanism*), certain Construction Period performance related deductions may be made from the Substantial Completion Milestone Payment.

22.1.2. Pursuant to Parts 2 and 3 of Schedule 6 (*Performance Mechanism*), certain Operating Period performance related deductions may be made from each Performance Payment.

22.2. Persistent Breach by Developer

22.2.1. If a breach of this Agreement by Developer (other than any breach that constitutes a Noncompliance Event or results in the accrual of a Construction Closure Deduction or an Operating Period Closure Deduction or that arises due to a Supervening Event) has:

a. continued for more than 30 consecutive Calendar Days; or

b. occurred three or more times in any six consecutive month period,

then the Enterprises may serve a notice (an "Initial Warning Notice") on Developer:

c. specifying that it is an Initial Warning Notice;

d. giving reasonable details of the breach; and

e. stating that the relevant breach is a breach which, if it continues for the period of time specified in Section 22.2.2.a or recurs as specified in Section 22.2.2.b, may result in a Developer Default for Persistent Breach,

provided that an Initial Warning Notice may not be served in respect of any incident of breach which has previously been the subject of a separate Initial Warning Notice or a Final Warning Notice.

22.2.2. If the breach specified in an Initial Warning Notice:

a. continues beyond 30 consecutive Calendar Days after the date of service of the Initial Warning Notice; or

b. recurs three or more times within the six consecutive month period after the date of service of the Initial Warning Notice,

then the Enterprises may serve another notice (a "Final Warning Notice") on Developer:

c. specifying that it is a Final Warning Notice;

d. stating that the breach specified has been the subject of an Initial Warning Notice; and

e. stating that:

i. the continuation of such breach for more than 30 consecutive Calendar Days after the date of service of the Final Warning Notice; or

ii. the recurrence of such breach two or more times within the six consecutive month period after the date of service of the Final Warning Notice,

shall constitute a "Persistent Breach", which itself shall constitute a Developer Default pursuant to Section 32.1.1.

23. SAFETY COMPLIANCE, SUSPENSION OF THE WORK AND PUBLIC SECTOR RIGHTS TO INTERVENE

23.1. Safety Compliance

23.1.1. Subject to their obligations under Section 23.1.2, the Enterprises may, in their discretion, issue Safety Compliance Orders to Developer from time to time.

23.1.2. Except in the case of an Emergency, the Enterprises shall use Reasonable Efforts:

a. to promptly inform Developer of any circumstance or information relating to the Project which, in the Enterprises' reasonable judgment, is likely to result in the issuance of a Safety Compliance Order; and

b. consult with Developer prior to issuing a Safety Compliance Order.

23.1.3. Developer shall promptly implement each Safety Compliance Order that the Enterprises issue pursuant to Section 23.1.1, including through the use of Reasonable Efforts by Developer to overcome any inability to comply with any Safety Compliance Order caused by a Supervening Event. The Enterprises shall be entitled to take action pursuant to Section 23.4.1.d if Developer fails to comply with its obligations pursuant to this Section 23.1.3.

23.2. Refusal of Access

The Enterprises reserve the right to refuse (or, alternatively, authorize the Department to refuse) access to the Right-of-Way by any Person:

a. if the Enterprises reasonably believe that:

i. the presence or activities of such Person on the Right-of-Way or any Additional Right-of-Way represents a material risk to the health or safety of any person, the Environment or Improvements, the community or property;

ii. such Person is under the influence of alcohol or drugs; or

iii. such Person is acting or threatening to act in a violent, harassing, discriminatory or illegal manner, or such Person previously acted in such a manner; or

b. who previously committed any of the conduct described in Section 23.2.a while accessing any part of the Site.

23.3. Suspension of Work

23.3.1. The Enterprises shall at all times have the right and authority to suspend, in whole or in part, the Work by written order to Developer. Any such order shall state the Enterprises' reasons for the required suspension of the Work.

23.3.2. Except where any suspension of the Work by the Enterprises pursuant to Section 23.3.1 is made (and continues):

a. in response to:

i. any uncured failure by Developer to comply with any Law, Governmental Approval or Permit; and/or

ii. the existence of conditions unsafe for workers, other Project personnel or the general public, including failures to comply with Project Standards related to safety or to comply with any Safety Compliance Order; or

b. pursuant to Section 25.3.3.b,

the issuance of any such suspension order (or the continuation of any such suspension order) shall constitute a Compensation Event.

23.4. Self-Help

23.4.1. Self-help rights

Without limiting any other rights of the Enterprises under this Agreement, if the Enterprises reasonably believe that they need to take action in connection with the Project or the Work as a result of:

a. an Emergency having occurred and being continuing;

b. any Developer Default having occurred and not having been cured within any relevant Developer Default Cure Period;

c. Developer having failed to comply with its obligations pursuant to Section 9.4.4.a with respect to any Defect in the Warrantied Elements or any other breach of the Warranties;

d. Developer having failed to comply with its obligations pursuant to Section 23.1.3 with respect to any Safety Compliance Order; and/or

e. being necessary to discharge a constitutional or statutory duty or a duty imposed on the Enterprises, CDOT or the State by any Law, or to facilitate any such discharge by the Enterprises, CDOT or the State,

then, subject to Lenders' rights pursuant to the Lenders Direct Agreement, the Enterprises shall be entitled to take action pursuant to Sections 23.4.2 and 23.4.3.

23.4.2. Notice of election to exercise self-help rights

Except in the case of an Emergency or a Developer Default, in which case the Enterprises shall only be obliged to use Reasonable Efforts to comply with their obligations under this Section 23.4.2, if the Enterprises wish to take action pursuant to Section 23.4.1 they shall notify Developer a reasonable time prior to taking such action, which notice shall include the following:

a. a description of any action that the Enterprises reasonably believe is necessary for them to take;

b. the reason for such action;

c. the date the Enterprises intend to commence such action;

d. the time period Developer has (if any) to take action before the Enterprises will commence such action;

e. the time period which the Enterprises believe will be necessary for such action; and

f. to the extent practicable, the effect on Developer and its obligation to perform the Work during the period such action is being undertaken.

23.4.3. Required actions

a. Following service of a notice by the Enterprises pursuant to Section 23.4.2 and expiration of any time within which Developer is permitted to take action pursuant to Section 23.4.2.d before the Enterprises will take action pursuant to Section 23.4.1, the Enterprises shall take such action as notified under Section 23.4.2 (or, in the case of an Emergency, as they may otherwise determine in their discretion) and any consequential additional action as they reasonably believe is necessary (together, the "Required Action"), and Developer shall use Reasonable Efforts to give all necessary assistance to the Enterprises while they are taking the Required Action.

b. Except in the case of an Emergency or a Developer Default, in which case the Enterprises shall only be obliged to use Reasonable Efforts to comply with their obligations under this Section 23.4.3.b, the Enterprises shall provide Developer with prompt notice of completion of the Required Action.

23.4.4. Reimbursement of Enterprises' costs and expenses

If the Enterprises take any Required Action in response to or because of any Developer breach of its obligations under this Agreement or any Developer Default, any costs and expenses of the Enterprises incurred in taking, or as a result of taking, such action shall be payable on demand by Developer to the Enterprises.

PART I: INDEMNIFICATION AND INSURANCE

24. INDEMNIFICATION AND NOTICE AND DEFENSE OF CLAIMS

24.1. No Obligation to Indemnify Developer

Neither the Enterprises, nor CDOT, have any obligation to indemnify Developer.

24.2. Developer Indemnity

Subject to Section 24.3 and Sections 35.2 through 35.6, Developer shall, to the fullest extent permitted by Law, release, protect, defend, indemnify and hold harmless each Enterprise, CDOT and the State (the "Principal Indemnified Parties") and each of their respective officers, directors, agents and employees (each of the Principal Indemnified Parties and each such Person, an "Indemnified Party" and, collectively, the "Indemnified Parties") from and against any and all Claims against an Indemnified Party and/or Losses suffered by an Indemnified Party arising from, or as a consequence of, performance or non-performance of any of Developer's obligations under this Agreement or breach by Developer of this Agreement, including any such Claims and/or Losses that are in respect of:

a. death or personal injury;

b. loss of or damage to any Indemnified Party's property (whether personal or real), equipment or facilities, regardless of whether such property, equipment or facilities are owned, leased or otherwise held by such Indemnified Party, including loss of use thereof;

c. any Claim against the Enterprises or CDOT by any third party in connection with the Enterprises or CDOT's use of any Project Intellectual Property in compliance with the terms of this Agreement;

d. any violation of Law, including any Federal or state securities Law or similar, or any Environmental Law, by any Developer-Related Entity;

e. the authorization, issuance, sale, trading, redemption or servicing of the PABs or any other bonds issued to finance the Project;

f. Developer's failure to comply with any requirement necessary to preserve the tax exempt status of interest paid on the PABs or other tax exempt bond; or

g. to the extent not otherwise a Claim or Loss that is in respect of any of the matters specified in Sections 24.2.a through 24.2.f, Claims asserted and/or Losses suffered by any third party (including (i) any counterparty to a Third Party Agreement and (ii) any officer, director, agent or employee who is an Indemnified Party), which such third party asserts against and/or claims from one or more of the Principal Indemnified Parties provided that such Claim and/or Loss shall only fall within the scope of this Section 24.2.g if and to the extent that any such Claim and/or Loss arose as a result of either:

    i. Developer's or any other Developer-Related Entity's breach or failure to perform any obligation that any Principal Indemnified Party owed to such third party (any such obligation, a "Relevant Obligation"); or

    ii. any act or omission of Developer or any other Developer-Related Entity that renders any Principal Indemnified Party unable to perform any Relevant Obligation or otherwise results in any Principal Indemnified Party having liability for such Claim and/or Loss;

    iii. the Relevant Obligation or any Principal Indemnified Party's potential liability for such Claim and/or Loss exists or arises under Law or any Governmental Approval, Permit or agreement (including a Third Party Agreement); and

iv. either:

A. if Section 24.2.g.i applies, the Enterprises have delegated performance of the Relevant Obligation to Developer pursuant to this Agreement; or

B. if Section 24.2.g.ii applies, the existence of the Relevant Obligation or the Principal Indemnified Party's potential liability for such Claim and/or Loss under any Law, Governmental Approval, Permit or agreement was known (or, with respect to any Relevant Obligation, should have been known) to Developer or such other Developer-Related Entity prior to the occurrence of the relevant breach, failure to perform, act or omission,

provided that nothing in this Section 24.2 shall limit or preclude Developer's right to claim any affirmative defense permitted by Law.

24.3. Exclusions from Developer Indemnity

Developer's indemnification and hold harmless obligations under Section 24.2 shall not extend to any Loss or Claim of an Indemnified Party to the extent that such Loss or Claim:

a. was, with respect to a Loss only, already the subject of an indemnity claim under Section 24.2 from another Indemnified Party; or

b. was directly caused by:

i. a Supervening Event;

ii. the fault, fraud, willful misconduct, criminal conduct, recklessness, bad faith or negligence of such Indemnified Party (including, for certainty, any such conduct by BE acting in its capacity as PABs Issuer);

iii. performance or non-performance by the Enterprises of any of their obligations under this Agreement;

iv. such Indemnified Party's violation of any Law (including, for certainty, any such violation by BE acting in its capacity as PABs Issuer); or

v. any event described in Section 27.4.4.a through 27.4.4.c; or

c. is comprised of a Claim asserted and/or Loss suffered by any third party (including (i) any counterparty to a Third Party Agreement and (ii) any officer, director, agent or employee who is an Indemnified Party) which third party asserts a Claim that is:

i. against one or more of the Principal Indemnified Parties;

ii. otherwise within the scope of the indemnity set out in Section 24.2; and

iii. covered by the worker compensation program of the Principal Indemnified Party against which the Claim is asserted; or

d. is not of a type specifically referenced in Sections 24.2.a through 24.2.f and such Loss or Claim:

i. arose from, or as a consequence of, Developer's performance (and not of any non-performance or breach) of its obligations under this Agreement; and

ii. could not have been avoided by Developer.

24.4. Claims by Employees

Developer's indemnification obligation under Section 24.2 in relation to Losses and/or Claims against an Indemnified Party by an employee of Developer, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, shall not be limited by any limitation on the amount or type of damages, compensation or benefits payable by or for

Developer or a Subcontractor under workers' compensation, disability benefit or other employee benefits laws.

24.5. Notice of Claims and Tender of Defense

If any of the Indemnified Parties receives notice of a Claim or otherwise has actual knowledge of a Claim that it believes is within the scope of the indemnity under Section 24.2, the Enterprises shall, without limiting their obligations under Section 25.4.2:

a. provide Developer with notice of any such Claim of which they are aware (together with a copy of all written materials that the Indemnified Parties receive asserting such Claim), provided, however, that any failure to give such notice will not constitute a waiver of any rights of the Enterprises except to the extent that the rights of Developer are actually prejudiced by such failure; and

b. subject to Section 24.6.2:

i. tender to any applicable insurers or Developer, as applicable, the Enterprises' defense of any Claim resulting from the same; and

ii. use Reasonable Efforts to cause CDOT and each other Indemnified Party to tender to the insurers or Developer, as applicable, CDOT's or such Indemnified Party's defense of any Claim resulting from the same.

24.6. Defense of Claims

24.6.1. Tender of defense

a. Subject to Section 24.6.2, if and to the extent defense of any Claim that is subject to Developer's indemnity under Section 24.2 is tendered to Developer, then within 30 Calendar Days after the receipt of such tender, Developer shall notify the Indemnified Party whether it has tendered the matter to an insurer (if applicable).

b. Subject to Section 24.6.2, if the insurer under any Insurance Policy accepts any tender of defense with respect to any Claim that is subject to Developer's indemnity under Section 24.2 or that is otherwise subject to such policy within the applicable time period required by Law:

i. the Parties shall use Reasonable Efforts to cooperate in the defense proffered by such insurer, including (with respect to Developer) communication and coordination of Developer's and its insurer's defense strategy with the Enterprises and the Colorado Attorney General's Office; and

ii. for purposes of this Agreement, each applicable Indemnified Party shall be deemed to be an insured party under the relevant Insurance Policy.

c. If any such Claim is not tendered to an insurer, or if an insurer has rejected the tender, Developer shall promptly notify the Indemnified Party whether Developer:

i. accepts tender of defense and confirms the Claim is subject to full indemnification under Section 24.2 without any reservation of rights to deny or disclaim full indemnification;

ii. accepts tender of defense with a reservation of rights, in whole or in part;

iii. is incapable of accepting such tender of defense due to an Indemnified Party's exercise of rights pursuant to Section 24.6.2, or otherwise has not been tendered defense of any relevant Claim by CDOT or any other Indemnified Party pursuant to Section 24.5.b.ii, or; or

iv. rejects the tender of defense, in which circumstance the Indemnified Party shall be entitled to select its own counsel and control the defense of such Claim, including the right to settle the Claim without Developer's consent:

A. following consultation by the Enterprises (to the extent they are the relevant Indemnified Parties) with Developer; and

B. without prejudice to such Indemnified Party's right to be indemnified by Developer.

d. If Developer accepts tender of defense pursuant to Section 24.6.1.c.i or Section 24.6.1.c.ii, then, subject to Section 24.6.2, Developer shall have the right to select legal counsel for the Indemnified Party with the prior written consent of such Indemnified Party, provided that Developer shall be responsible for all costs and expenses related to such defense and each such counsel.

e. Notwithstanding any Developer acceptance of tender of defense pursuant to Section 24.6.1.c.i or Section 24.6.1.c.ii, Developer acknowledges and agrees that each Indemnified Party retains all rights with regard to settlement of any Claim that is subject to Developer's indemnity under Section 24.2, and Developer (or counsel appointed by Developer or its insurer) shall seek the consent of such Indemnified Party (with respect to the Enterprises as Indemnified Parties, such consent not to be unreasonably withheld) and of the Colorado Attorney General's Office to any settlement terms and conditions.

f. Developer shall not be liable for any settlement by an affected Indemnified Party of a Claim that is subject to Developer's indemnity under Section 24.2 except:

i. where Developer (or its insurer) has given its prior written consent to such settlement, which consent shall not be unreasonably withheld;

ii. with respect to any settlement made pursuant to Section 24.6.1.c.iv; or

iii. where the settlement is approved by a court of competent jurisdiction and such court approval has become final and binding.

24.6.2. Reservation of rights

Developer acknowledges and agrees that:

a. the Colorado Attorney General's Office:

i. is required by Law to represent and defend the Enterprises and CDOT; and

ii. may appoint counsel of its selection to act as Special Assistant Attorney General in respect of any particular Claim;

b. certain other Indemnified Parties may have similar statutory representation obligations and rights; and

c. consequently, the Enterprises and such other Indemnified Parties have the right in their discretion to:

i. elect at any time to conduct their own defense with respect to a Claim that is within the scope of the indemnity under Section 24.2; or

ii. agree to allow such defense to be conducted in whole, in part or in conjunction with counsel appointed by Developer or its insurer, subject (with respect to the Enterprises, CDOT and the State) to Approval of such counsel by the Colorado Attorney General's Office.

25. INSURANCE

25.1. Obligation to Obtain and Maintain Insurance

25.1.1. Developer shall, at a minimum, obtain and maintain, or cause to be obtained and maintained, all insurance policies specified in Schedule 13 (*Required Insurances*) (the "Insurance Policies") pursuant to the requirements of this Section 25 and Schedule 13 (*Required Insurances*). Developer may satisfy such requirements by:

a. placing any of the Insurance Policies on a Project-specific basis; and/or

b. relying on corporate policies of Developer-Related Entities (or their Affiliates),

provided that all other applicable requirements of this Section 25 and Schedule 13 (*Required Insurances*) are satisfied.

25.1.2. Notwithstanding Section 25.1.1, Developer acknowledges and agrees that:

a. the Enterprises make no representation or warranty as to the adequacy or sufficiency of the minimum Insurance Policy requirements specified in this Agreement, including as to whether such Insurance Policies shall be adequate to protect Developer against:

i. the performance or non-performance of its obligations under this Agreement;

ii. the risks it is assuming under this Agreement; and

iii. its liabilities to any third party;

b. except as otherwise expressly provided in this Agreement, no limit of liability specified for any Insurance Policy, or approved variances therefrom, shall preclude the Enterprises from exercising any right otherwise available to them under this Agreement or at Law; and

c. to the extent required by Law in connection with Work to be performed during the Term, Developer shall obtain and maintain, or cause to be obtained and maintained, in addition to the Insurance Policies, such other insurance policies for such amounts, for such periods of time and subject to such terms, as required by Law.

25.1.3. For certainty, the insurance coverage Developer is required to obtain and maintain, or cause to be obtained and maintained, pursuant to Sections 25.1.1 and 25.1.2.c may support but shall not limit Developer's indemnification and defense obligations under this Agreement.

25.2. General Insurance Requirements

25.2.1. Placement of insurance with Eligible Insurers

a. All Insurance Policies shall be obtained from, and maintained with, Eligible Insurers.

b. If an insurer providing any Insurance Policy ceases to be an Eligible Insurer, then Developer shall promptly, and in any event within 21 Calendar Days of such event occurring, secure alternate coverage with an Eligible Insurer unless the Enterprises otherwise Approve the continued maintenance of such Insurance Policy with the existing insurer.

25.2.2. Language; governing law

All Insurance Policies shall be issued in the English language and governed by the laws of the State of Colorado or the State of New York.

25.2.3. Developer liability and deductibles

Except to the extent included in any Termination Amount or in any compensation paid with respect to a Supervening Event or Change, as between Developer and the Enterprises, Developer shall be liable for all insurance deductibles, premiums, and liabilities in excess of the coverage provided under any Insurance Policy, and the Enterprises shall have no liability for the same.

25.2.4. Primary coverage

a. Each Insurance Policy shall provide that the coverage thereof is primary and non-contributory with respect to all named insureds, additional insureds (including the Enterprises, CDOT and the Specified Additional Insureds) and loss payees, as their interests may appear.

b. Any insurance or self-insurance that is maintained by an insured or any additional insured (including the Enterprises, CDOT and any Specified Additional Insured) in addition to any Insurance Policy shall be in excess of such Insurance Policy and not contribute with it.

25.2.5. Endorsements

Each Insurance Policy (excluding those required pursuant to Section 1.3, Section 1.4, Section 1.6, Section 1.8, Section 1.10, Section 2.3, Section 2.5, and Section 2.6 of Schedule 13 (*Required Insurances*)) shall be written or endorsed such that:

a. any:

i. failure on the part of a named or any additional insured (including any Specified Additional Insured) to comply with reporting provisions or other conditions of such Insurance Policy;

ii. breach of representation or warranty by, breach of any provision in such policy by, or other action or inaction of, a named insured, any additional insured (including any Specified Additional Insured) or others; or

iii. change in ownership of all or any portion of the Project or Developer's interest in the same,

shall not affect or vitiate the coverage provided under such Insurance Policy to the other named insureds or any additional insureds (including any Specified Additional Insured) (or to any such named insured's or additional insured's respective members, directors, officers, employees and agents);

b. such Insurance Policy shall apply separately to each named insured and additional insured (including any Specified Additional Insured) against whom a claim is made or suit is brought, except with respect to the limits of the insurer's liability;

c. endorsements adding additional insureds (including Specified Additional Insureds) to required policies shall contain no limitations, conditions, restrictions or exceptions to coverage beyond those that apply under the Insurance Policy generally, including, for certainty, any limitation, condition, restriction or exception to coverage due to the absence of a direct contractual relationship between the additional insured and the named insured or, if different, the Person that obtained the insurance; and

d. Specified Additional Insureds may be added as additional insureds from time to time as anticipated by the definition thereof,

in the case of each of paragraphs a. to d., to the extent not prohibited by Law.

25.2.6. Prior notice of cancellation, suspension, modification etc.

Each Insurance Policy shall be written or endorsed such that coverage under, and limits with respect to, such Insurance Policy cannot be canceled, voided, suspended, lapsed, modified or reduced except following 30 Calendar Days' (or for non-payment of premium, 10 Calendar Days') prior notice to the Enterprises, where the insurer shall not have any limitation of liability for failure to provide such notice.

25.2.7. Waivers of subrogation

a. The Enterprises waive all rights against each Developer-Related Entity, and Developer waives all rights against the Enterprises, CDOT and each Specified Additional Insured, in each case for any claims to the extent covered and paid by the Insurance Policies, or by any other insurance obtained and maintained pursuant to Section 25.1.2.c, except such rights as they may have to the proceeds of such insurance.

b. Developer shall require each Principal Subcontractor and all Subcontractors, to the extent applicable, to provide written waivers (equivalent to Developer's waivers set out in

Section 25.2.7.a) in favor of the Enterprises, CDOT and each Specified Additional Insured.

c. The Enterprises may, at their discretion (provided that such discretion is exercised and notice of the same is given to Developer at least 15 Calendar Days prior to any associated loss), require Developer to provide written waivers equivalent to the waivers set out in Sections 25.2.7.a and 25.2.7.b in favor of the City of Denver (other than in its capacity as Cover Top Maintainer) and Denver Public Schools.

25.2.8. Defense costs

No defense costs shall be included within or erode the limits of coverage under any Insurance Policy, except that defense costs may be included within the limits of coverage under each Insurance Policy required pursuant to Sections 1.2, 1.4, 1.5, 1.6, 2.2, 2.4, 2.5 and 2.6 of Schedule 13 (*Required Insurances*).

25.2.9. Exhaustion of limits

With respect to each Insurance Policy (excluding those that are specific to this Project) required pursuant to Sections 1.2 and 2.2 of Schedule 13 (*Required Insurances*), whenever the aggregate limit is exhausted by at least 25% of the required aggregate limit by claims paid or reserved by insurer(s) (such that, for certainty, 75% or less of such required aggregate limit then remains available), Developer shall promptly:

a. notify the Enterprises of such exhaustion; and

b. and in any event within five Working Days, deliver evidence to the Enterprises (such evidence reasonable satisfactory to the Enterprises) that Developer has obtained, or caused to be obtained, additional insurance to reinstate the aggregate limit to the minimum amount required by Section 1.2 or Section 2.2 of Schedule 13 (*Required Insurances*), as the case may be.

25.3. Verification of coverage

25.3.1. Developer shall, not less than five Working Days prior to the effective (or renewal) date of each Insurance Policy, deliver to the Enterprises:

a. a written certificate of insurance that:

i. is on the most recent ACORD form consistent with the required coverage and in standard form;

ii. states the identity of all insurers, named insureds and additional insureds;

iii. states the type and limits of coverage;

iv. includes as attachments all additional insured endorsements; and

v. is signed by an authorized representative of the insurer shown on the binder; and

b. a letter from the Insurance Broker placing the Insurance Policy addressed to the Enterprises certifying that:

i. such Insurance Broker has reviewed this Section 25 and Schedule 13 (*Required Insurances*);

ii. the Insurance Policy so certified has been issued in accordance with this Section 25 and Schedule 13 (*Required Insurances*);

iii. all premiums in respect of such Insurance Policy have been paid, or arrangements have been made to pay such premiums in a timely manner; and

iv. in the absence of material non-disclosure, misrepresentation or fraud by the named insured, the Enterprises may rely on such letter.

25.3.2. Developer shall promptly, and in any event no later than 90 Calendar Days after the effective (or renewal) date of each Insurance Policy, deliver to the Enterprises a true and complete certified copy of each such Insurance Policy, including all endorsements thereto, provided that if any Insurance Policy insures subject matter other than the Work or the Project (or any part of either thereof) any reference to such other subject matter (including any confidential information as determined in compliance with the disclosure protocol Accepted by the Enterprises pursuant to Section 20.1.2) may be removed or redacted from such certified copies so long as such certified copies are accompanied by a letter from the Insurance Broker confirming that such removal or redaction has no effect on the conclusions in the letter that it previously provided pursuant to Section 25.3.1.b in respect of such Insurance Policy.

25.3.3. If Developer fails to comply with its obligations under Sections 25.2.1.b, 25.3.1 or 25.3.2, the Enterprises shall, without limiting any of their other rights under this Agreement, have the right, but not the obligation, without notice to Developer, to:

a. obtain any insurance that is the subject of such failure at Developer's cost and expense; or

b. for so long as such failure continues, exercise their right to suspend, in whole or in part, the Work pursuant to Section 23.3.1.

25.4. Reporting and Handling of Claims

25.4.1. Developer's obligations to report and process claims

a. Unless notified otherwise by the Enterprises pursuant to Section 25.4.2.a with respect to the Enterprises' (or CDOT's) insurance claims (and potential claims), as between the Enterprises and Developer, Developer shall:

i. promptly report and process all potential claims under the Insurance Policies;

ii. promptly and diligently pursue claims pursuant to the claims procedures specified in such Insurance Policies, whether for defense or indemnity or both; and

iii. enforce all legal rights against insurers under the Insurance Policies and under Law in order to collect on all claims, including pursuing necessary litigation and enforcement of judgments, provided that Developer shall be deemed to have satisfied this obligation if a judgment is not collectible through the exercise of lawful and diligent means,

in each case, to the extent applicable, following (x) notice to and regular consultation with the Enterprises pursuant to Section 25.4.1.b and (y) the use by Developer of Reasonable Efforts to reflect Enterprises' resulting input.

b. Developer shall:

i. promptly notify the Enterprises of any incident, potential claim, claim or other matter of which Developer becomes aware that:

A. involves or could conceivably involve an Indemnified Party as a defendant;

B. involves a claim or potential claim by Developer or any other Person under an Insurance Policy, or any other insurance obtained and maintained pursuant to Section 25.1.2.c, with, in any such case, a potential value of (indexed) or more;

C. involves a claim which is being denied by an insurer; or

D. involves a fatality, and

ii. regularly consult with the Enterprises (as and when reasonably requested by the Enterprises) regarding, and thereafter keep the Enterprises fully informed of, any incident, claim or matter of the type referenced in Sections 25.4.1.b.i.A through

25.4.1.b.i.D (including, for certainty, any such incident, claim or matter of which Developer becomes aware by notice from the Enterprises).

25.4.2. Enterprise involvement in reporting and processing claims

a. Notwithstanding Section 25.4.1, the Enterprises (and CDOT, to the extent it is a Specified Additional Insured with respect to any relevant Insurance Policy) shall have the right, but not the obligation, to report directly to insurers and, subject to prior notice to Developer, process the Enterprises' (or, as applicable, CDOT's) claims under the Insurance Policies.

b. The Enterprises agree to promptly:

i. notify Developer of any Enterprise and/or CDOT incident, or any Claim or potential Claim against the Enterprises and/or CDOT, and/or any other matters that are reasonably expected to give rise to an insurance claim, in each case of which the Enterprises become aware; and

ii. subject to Sections 24.6.1 and 24.6.2, to:

A. tender to any applicable insurers the Enterprises' defense of any Claim against the Enterprises; and

B. use Reasonable Efforts to procure that CDOT tenders to the insurers its defense of any Claim against it.

c. The Enterprises shall use Reasonable Efforts to cooperate with Developer as necessary for Developer to satisfy its obligations under Sections 25.4.1 and 24.6.1, including providing Developer a copy of all written materials that the Enterprises receive asserting a Claim against the Enterprises and/or CDOT that is subject to defense by an insurer under an Insurance Policy.

25.4.3. Insurance meetings

Without limiting Developer's obligations under this Section 25.4, Developer and Developer's insurers and control claims adjuster shall provide the Enterprises' with claim updates from designated insurance representatives at such intervals as the Enterprises may reasonably request, but no less than twice in each Calendar Year, to review all incidents, potential claims and claim files together with such other matters related to the Insurance Policies as the Enterprises may reasonably request.

25.5. Reinstatement

25.5.1. Use of Physical Damage Proceeds and conduct of Reinstatement Work

a. All insurance proceeds received under the Insurance Policies in respect of physical property damage to the Work or the Project (excluding any delay in startup or business interruption insurance maintained as part of such policies, "Physical Damage Proceeds") shall be applied by Developer to perform work ("Reinstatement Work") necessary to repair, reconstruct, reinstate and replace each part of the Work and the Project in respect of which such proceeds were received.

b. Prior to carrying out Reinstatement Work for which Physical Damage Proceeds have been received or are payable in an amount in excess of (indexed) in respect of a single event (or a series of related events), Developer shall:

i. prepare, and submit to the Enterprises for Acceptance, a plan (a "Reinstatement Plan") for performing and completing such Reinstatement Work in accordance with this Agreement (for which purposes the requirements of Schedule 10 (*Design and Construction Requirements*) shall be deemed to apply to the Reinstatement Work); and

ii. following the Enterprises' Acceptance of any such Reinstatement Plan, promptly perform the Reinstatement Work in accordance with such plan, while regularly

keeping the Enterprises informed in relation to the progress of such Reinstatement Work,

provided that, pending submission or Acceptance of any Reinstatement Plan, Developer shall promptly begin performing any Reinstatement Work to the extent necessary to comply with Law or to address a material risk to the health or safety of any person or the Environment or any Improvements.

c. Completion of any Reinstatement Work shall be subject to Acceptance by the Enterprises.

d. If the Expiry Date or Termination Date occurs prior to the completion of all Reinstatement Work, Developer shall pay, or arrange for payment of, all remaining Physical Damage Proceeds (excluding those held by the Enterprises in the Physical Damage Proceeds Reserve) to the Enterprises. For certainty, the Enterprises may include any such proceeds that are owed but not yet paid to them as part of the Termination Deduction Amount for purposes of calculating any Termination Amount pursuant to Schedule 7 (*Compensation on Termination*).

25.5.2. Physical Damage Proceeds Reserve

a. Developer shall ensure that, if the Physical Damage Proceeds received in respect of a single event (or a series of related events) are, in aggregate, in excess of (indexed), all such proceeds shall be paid to the Enterprises to be held as a reserve (the "Physical Damage Proceeds Reserve"). The Enterprises shall hold the Physical Damage Proceeds Reserve as a sub-account within its general accounts for purposes of Sections 25.5.2.b and 25.5.2.c and shall only withdraw monies therefrom in accordance with Sections 25.5.2.b and 25.5.2.c. For certainty, Developer shall have no interest in the Physical Damage Proceeds Reserve other than its contractual right to reimbursement pursuant to Section 25.5.2.b.

b. The Enterprises shall promptly reimburse Developer for reasonable and documented third-party costs and expenses incurred by Developer to effect the Reinstatement Work to the extent that:

i. such work complies with the Accepted Reinstatement Plan;

ii. funds are available in the Physical Damage Proceeds Reserve; and

iii. such funds were paid into such reserve in connection with the event (or series of related events) to which such costs and expenses relate.

c. Following completion of any Reinstatement Work in respect of which Physical Damage Proceeds are held by the Enterprises as a Physical Damage Proceeds Reserve, the Enterprises shall promptly return any amounts remaining in such Physical Damage Proceeds Reserve to Developer.

d. If the Termination Date or the Expiry Date occurs prior to the completion of any Reinstatement Work, the Enterprises shall be entitled to retain any amounts then standing to the credit of the Physical Damage Proceeds Reserve, subject to Developer's continuing right to:

i. reimbursement pursuant to Section 25.5.2.b after the Expiry Date occurs for such Reinstatement Work performed prior to the Expiry Date; and

ii. except in the case of a termination for Developer Default, receive any amounts due under Section 25.5.2.c but not returned prior to the Termination Date or the Expiry Date, as applicable (but without double-counting with respect to the calculation of any Termination Amount).

25.6. Unavailability of Insurance

25.6.1. Unavailability due to an Uninsurable risk

a. If a risk otherwise covered by any Insurance Policy becomes, or is likely to become, Uninsurable then:

i. Developer shall notify the Enterprises promptly, and in any event within five Working Days, after becoming aware of that any such risk has become, or is likely to become, Uninsurable;

ii. Developer shall thereafter provide the Enterprises with such information as the Enterprises reasonably request regarding the Uninsurable risk; and

iii. the Parties shall promptly meet to discuss the means by which the risk should be managed or shared under the circumstances.

b. If it is Agreed or Determined that any risk has become Uninsurable, then:

i. Developer shall be relieved of its obligations pursuant to Section 25.1.1 to the extent, and only to the extent, that Developer's inability to comply with such obligations is due directly to, and limited to the duration of, such risk having become Uninsurable; and

ii. the Enterprises shall (at their discretion):

A. terminate this Agreement pursuant to Section 33.1.7 and pay to Developer an amount equal to the amount calculated pursuant to Section 2 of Schedule 7 (*Compensation on Termination*);

B. elect to continue this Agreement, in which case, but only for so long as such risk remains Uninsurable:

(I) the Enterprises agree that, following the occurrence of such risk, they shall pay Developer an amount equal to the insurance proceeds that would have been payable to Developer under the Insurance Policies had such risk not become Uninsurable, subject to the limitations, conditions and exclusions set out in the certificates and policies of insurance relating to the relevant Insurance Policies most recently provided by Developer to the Enterprises (or, if no such certificates or policies of insurance have previously been provided, such limitations, conditions and exclusions as the Enterprises may reasonably determine would have applied), provided that Developer shall remain responsible for any deductibles; and

(II) in respect of each month during any part of which the relevant insurance relating to such risk is not maintained, Developer shall pay to the Enterprises, or (at the Enterprises' discretion during the Operating Period) the Enterprises shall set-off against the Performance Payments pursuant to Section 5 of Part 3 of Schedule 4 (*Payments*), an amount equal to the premium paid by Developer in respect of the relevant risk in respect of the month prior to such risk becoming Uninsurable (using a reasonable estimate of such amount where a precise figure is not available and pro-rating any annual or other premium previously payable where appropriate); or

C. issue an Enterprise Change, as a result of which:

I. Developer shall be left in a No Better and No Worse position (relative to the position that it would have been in had the

Enterprises elected to proceed under Section 25.6.1.b.ii.B) with respect to such Uninsurable risk; and

II. the ability of Developer to comply with this Agreement shall not be adversely affected as a consequence,

and, for certainty, this Agreement shall continue.

c. For so long as any risk remains Uninsurable and this Agreement remains in effect, Developer shall approach the insurance market at least once every three months to establish whether the risk continues to be Uninsurable. Promptly upon Developer becoming aware that the risk is no longer Uninsurable, Developer shall, as soon as is reasonably practicable, take out and maintain, or cause to be taken out and maintained, the insurance required to be maintained for such risk pursuant to this Agreement, and on such insurance becoming effective the provisions of Section 25.6.1.b shall cease to apply in respect of such risk.

25.6.2. Unavailable Terms

a. If any Insurance Term that would otherwise be included in an Insurance Policy becomes, or is likely to become, an Unavailable Term then:

i. Developer shall notify the Enterprises promptly, and in any event within five Working Days, after becoming aware of the existence of an Unavailable Term or the likelihood of an Insurance Term becoming an Unavailable Term;

ii. Developer shall thereafter provide the Enterprises with such information as the Enterprises reasonably request regarding the Unavailable Term; and

iii. the Parties shall promptly meet to discuss the means by which the existence of such Unavailable Term should be managed or its consequences shared under the circumstances.

b. If it is Agreed or Determined that an Insurance Term has become an Unavailable Term, then:

i. Developer shall be relieved of its obligations pursuant to Section 25.1.1 to include the relevant Insurance Term in the relevant Insurance Policies to the extent, and only to the extent, that Developer's inability to comply with such obligations is due directly to, and limited to the duration of, such term having become an Unavailable Term; and

ii. in respect of each month during any part of which the relevant Insurance Term is an Unavailable Term, Developer shall pay to the Enterprises, or (at the Enterprises' discretion during the Operating Period) the Enterprises shall set-off against the Performance Payments pursuant to Section 5 of Part 3 of Schedule 4 (*Payments*), an amount of premium equal to the amount paid by Developer in respect of the Unavailable Term in respect of the month prior to such term becoming an Unavailable Term (using a reasonable estimate of such amount where a precise figure is not available and pro-rating any annual or other premium previously payable where appropriate) net of any annual amount paid or payable by Developer with respect to such month to maintain, or cause to be maintained, any (whether full or partial) alternative or replacement term and/or condition in respect of such Insurance Term pursuant to Section 25.6.2.d.

c. For so long as an Insurance Term is an Unavailable Term, Developer shall approach the insurance market at least once every three months to establish that the relevant term remains an Unavailable Term. Promptly upon Developer becoming aware that the term is no longer an Unavailable Term, Developer shall, as soon as is reasonably practicable, take out and maintain, or cause to be taken out and maintained, the relevant insurance including such previously Unavailable Term pursuant to this Agreement, and on such

insurance becoming effective the provisions of Section 25.6.2.b shall cease to apply in respect of such Insurance Term.

d. Notwithstanding Section 25.6.2.b, to the extent that it is Agreed or Determined that an alternative to or replacement of the Unavailable Term is available to Developer in the worldwide insurance market with Eligible Insurers, which if included in the relevant Insurance Policy would fully or partially address Developer's inability to fully comply with its obligations pursuant to Section 25.1.1, at a cost which contractors in relation to transportation-related infrastructure projects in the United States are (at such time) generally prepared to pay, Developer shall obtain and maintain, or cause to be obtained and maintained, insurance including such alternative or replacement Insurance Term.

25.7. Benchmarking of Insurance Costs

25.7.1. The procedure set out in this Section 25.7 shall be used to determine how the Parties shall share any increase, or benefit from any decrease, in the cost of Benchmarked Insurances.

25.7.2. Developer shall cause the Insurance Broker to prepare (at Developer's cost and expense) and deliver to the Enterprises (no later than 10 Working Days after the end of the most recent Insurance Review Period a report in respect of such Insurance Review Period (the "Joint Insurance Cost Report"). Each Joint Insurance Cost Report shall be addressed to both Developer and the Enterprises on a reliance basis.

25.7.3. Each Joint Insurance Cost Report shall, at a minimum, contain the following information in respect of the relevant Insurance Review Period:

a. a full breakdown of the Actual Benchmarked Insurance Cost;

b. a full breakdown of the Base Benchmarked Insurance Cost;

c. the Proposal Insurance Cost;

d. a spreadsheet detailing separately:

i. the sum(s) insured/limit(s) of indemnity (i.e. rateable factor) for each of the Benchmarked Insurances;

ii. the premium rate for each of the Benchmarked Insurances;

iii. the net premium paid (or to be paid) for each of the Benchmarked Insurances (i.e. excluding both insurance premium tax and broker's costs and expenses);

iv. the actual deductible(s) applicable to the calculations made in the Joint Insurance Cost Report; and

v. details of all claims paid or reserved (including incident date and type and amount of claim);

e. an assessment, quantification and breakdown of each increase or decrease in insurance costs that, in aggregate, determine the amount of any Project Insurance Change together with an explanation of the reasons therefor;

f. the calculation of any Insurance Cost Increase or any Insurance Cost Decrease and of any resulting Exceptional Cost or Exceptional Saving arising from this calculation;

g. the opinion of the Insurance Broker as to the reasons why the Actual Benchmarked Insurance Cost has varied from the Proposal Benchmarked Insurance Cost, specifying the impact of each explanatory factor and quantifying the amount attributable to each such factor; and

h. such other evidence as reasonably requested by the Enterprises of any changes to circumstances generally prevailing in the Relevant Insurance Markets that the Insurance Broker indicates to account for the Insurance Cost Increase or the Insurance Cost Decrease.

25.7.4. The Enterprises, at their discretion and at their cost and expense, may independently assess the accuracy of the information in the Joint Insurance Cost Report and otherwise conduct their own independent insurance review, which review may include retaining advisors and/or performing their own assessment as to, among other things, the impact of the claims history on renewal costs. Developer shall cooperate with respect to any reasonable requests from the Enterprises for additional information in relation to such independent assessment (including, if applicable, by ensuring that the Insurance Broker provides any reasonably requested additional information).

25.7.5. No later than 60 Calendar Days' after Developer's submission of any Joint Insurance Cost Report, the Enterprises shall (acting reasonably) determine in respect of the Insurance Review Period to which such report relates, and with reference to such report, whether:

a. there is an Exceptional Cost, in which case the Enterprises shall within 45 Calendar Days of such determination make a one-off lump-sum payment to Developer equal to 80% of the Exceptional Cost;

b. there is an Exceptional Saving, in which case Developer shall within 30 Calendar Days of such determination make a one-off lump-sum payment to the Enterprises equal to 80% of the Exceptional Saving; and

c. there is neither an Exceptional Cost nor an Exceptional Saving, in which case any Insurance Cost Increase or any Insurance Cost Decrease shall be borne by or be for benefit of Developer.

PART J: EQUITY AND PROJECT DEBT

26. EQUITY REQUIREMENTS

26.1. Equity Contribution Requirements

26.1.1. Subject to Section 26.1.2, on and from the Financial Close Date through and including the Substantial Completion Date, Developer shall, at all times, have and maintain Committed Investments equal to or greater than 10% of the amount equal to the aggregate of:

a. the then Committed Investment; *plus*

b. the total principal amount of the then outstanding Long Term Project Debt.

26.1.2. The minimum amount of Committed Investments required under Section 26.1.1 is subject to reduction only:

a. with the Approval of the Enterprises; or

b. with the Acceptance of the Enterprises in the event that the amount of Committed Investments is required to be reduced below such percentage:

i. as part of a workout of a breach or default under the Financing Documents that were entered into in connection with Financial Close; or

ii. as a result of Developer incurring additional Project Debt pursuant to a Rescue Refinancing.

26.2. Equity Transfer and Change of Control Restrictions

26.2.1. A Developer Default shall occur if an Equity Transfer in relation to Developer is effected:

a. during the Restricted Transfer Period, unless such Equity Transfer:

i. is a Permitted Equity Transfer; or

ii. received the prior Approval of the Enterprises;

b. after the Restricted Transfer Period, if such Equity Transfer results in a Change of Control that has not been consented to by the Enterprises pursuant to Section 26.2.2; and

c. at any time (other than as a Permitted Equity Transfer under paragraph a. of the definition thereof in Part A of Annex A (*Definitions and Abbreviations*)), to a Person that at the time of the proposed transfer is disqualified, suspended or debarred, or subject to a proceeding to suspend or debar such Person, from bidding, proposing or contracting with any Governmental Authority.

26.2.2. After the Restricted Transfer Period, any Equity Transfer that results in a Change of Control shall require the consent of the Enterprises, provided that such consent may be (i) withheld or (ii) made subject to the condition of the provision of reasonable additional security or other reasonable arrangements, in either case (i) and (ii) if (and only if) the Enterprises determine, acting reasonably, that:

a. the proposed transaction or transactions is or are prohibited by Law; or

b. after the occurrence of such Change of Control Developer's ability to perform its obligations under this Agreement would be materially diminished, which determination may be based upon, or take into account in addition to other factors that the Enterprises may reasonably determine are relevant, the financial strength, integrity, past performance and relevant experience of the proposed transferee(s) relative to the proposed transferor(s) and the then current performance requirements under this Agreement.

26.2.3. The Enterprises may reasonably request, and following receipt of any such request Developer shall promptly provide to the Enterprises, any or all of the following information regarding a

proposed transferee in connection with any Equity Transfer that would result in a Change of Control in order to enable the Enterprises to determine whether or not to provide their consent to such Equity Transfer pursuant to Section 26.2.2:

a. the name and address of the proposed transferee;

b. unless such proposed transferee is a publicly traded entity, the names of the proposed transferee's shareholders or members together with the share capital or partnership or membership interests, as the case may be, held by each of them;

c. the manner in which the proposed transferee shall be financed and the extent to which such financing is committed (to the extent relevant);

d. copies of the proposed transferee's financial statements (audited, if available) for its three most recent financial years (or such shorter period as such entity has been in existence) or, in the case of a special purpose company, its opening balance sheet;

e. a copy of the proposed transferee's organizational documents; and

f. details of the resources available to the proposed transferee and the proposed transferee's qualifications, experience and/or technical competence to fulfill the obligations of the transferor, as applicable, including the names, qualifications, experience and/or technical or other professional competence of the proposed transferee's directors and any key personnel who shall have responsibility for the day-to-day management of its participation in the Project as transferee.

26.2.4. Developer shall use Reasonable Efforts to provide the Enterprises with at least 30 Calendar Days' prior notice of any Equity Transfer in relation to Developer excluding any Permitted Equity Transfer as described in paragraph a. of the definition thereof in Part A of Annex A (*Definitions and Abbreviations*).

26.2.5. Any Equity Transfer made or purportedly made in violation of the restrictions set out in Sections 26.2.1 or 26.2.2 shall be null and void.

26.2.6. Developer agrees to reimburse the Enterprises for all reasonable costs and expenses incurred by the Enterprises in connection with its review of any Equity Transfer.

27. DEBT FINANCING

27.1. Developer Responsibilities for Financing

27.1.1. Developer is solely responsible for obtaining and repaying all financing necessary for the Work and the Project, without recourse to the Enterprises except as expressly permitted or specified in this Agreement. Subject to Schedule 1 (*Financial Close*), Developer exclusively bears the risk of any changes in the interest rate, credit spreads, payment provisions, collateral requirements, financing charges, breakage charges or other terms of any of its financing commitments.

27.1.2. If Developer seeks to utilize PABs or a TIFIA Loan to finance the Work and the Project, then Developer is responsible for obtaining necessary approvals, complying with all applicable Federal, State and local requirements and achieving Financial Close, in each case subject to, and without prejudice to the Enterprises' (including the PABs Issuer's) obligations under, Section 27.4 and Schedule 1 (*Financial Close*).

27.2. Mandatory Terms of Financing Documents

Each Financing Document, including any amendments or supplements thereto, shall comply with, and, as required, incorporate the terms set out in, Part B of Schedule 16 (*Mandatory Terms*).

27.3. Limited Permission to Grant Security

27.3.1. Developer may grant security interests in, or assign its interest in, any and all of its rights, title and interests in, to, under or derived from:

a. this Agreement (including any such rights, title and interests in, to or derived from payments made by the Enterprises to Developer hereunder);

b. the Subcontracts;

c. each Contractor Bond;

d. the Insurance Policies (provided that any such security interest or assignment does not result in a violation of Section 25.5);

e. the Supplemental Indenture; and

f. the Central 70 Note,

(excluding any rights or interests to or in the Handback Reserve Account or the Physical Damage Proceeds Reserve) to Lenders exclusively for purposes of securing the Project Debt, subject to the terms and conditions contained in this Agreement.

27.3.2. Developer is strictly prohibited from mortgaging, pledging or encumbering, or creating a lien, charge or security interest on or against, its interest in, and its rights and obligations under, this Agreement, the Subcontracts, any Contractor Bonds, the Insurance Policies, the Supplemental Indenture and the Central 70 Note, or any portion thereof, to secure any indebtedness of any Person other than:

a. itself;

b. any special purpose entity that owns Developer but has no other assets and has purposes and powers limited to the Project and the Work;

c. a special purpose entity subsidiary owned by either Developer or by an entity described in Section 27.3.2.b; or

d. the PABs Issuer,

and no Security Document or other instrument purporting to do the same shall extend to or affect the right, title and interest of the Enterprises in the Project or the Enterprises' rights or interests under this Agreement.

27.3.3. Notwithstanding the foreclosure or other enforcement of any security interest created by, or assignment made pursuant to, a Security Document, Developer shall remain liable to Enterprises for the payment of all sums owing to the Enterprises under this Agreement and the performance and observance of all of Developer's obligations under this Agreement.

27.4. Limitations on Enterprise Involvement in and Liability for any Financing

27.4.1. The Enterprises shall use Reasonable Efforts in order to assist Developer's efforts to achieve Financial Close with a TIFIA Loan and/or PABs (including, with respect to any TIFIA Loan, by providing such information to the Build America Bureau as the Build America Bureau or Developer may reasonably request from time to time), provided that, subject to Schedule 1 (*Financial Close*), the Enterprises shall not bear any risk for the failure to obtain funding from either of these potential sources (for certainty, except to the extent expressly provided in Schedule 1 (*Financial Close*), including following the occurrence of a Key Financial Event), and any such failure shall not diminish Developer's obligations under this Agreement.

27.4.2. None of the Enterprises, CDOT or any other Governmental Authority, other than the PABs Issuer to the extent of its obligations in relation to the PABs issued by it and BE in connection with its obligations in respect of the Central 70 Note, shall:

a. without prejudice to, and without altering, the Enterprises' obligations pursuant to Sections 15 and 33 and Schedule 7, and subject to the terms of the Lenders Direct

Agreement, have any liability whatsoever for payment of any Project Debt, or of any other indebtedness issued or incurred by any Person in connection with this Agreement or the Project, or any interest accrued thereon or any other sum secured by or accruing under any Financing Document; or

b. join in, execute or guarantee any note or other evidence of indebtedness incurred in connection with this Agreement, the Project or under any Financing Document.

27.4.3. Any review or comment by the Enterprises of any Financing Document is not:

a. a guarantee or endorsement of the Project Debt or any other obligations issued or incurred by any Person in connection with this Agreement or the Project; or

b. a representation, warranty or other assurance as to the ability of any Person to perform its obligations with respect to the Project Debt or with respect to any other obligations of such Person in connection with this Agreement or the Project.

27.4.4. Except in the case of:

a. default by the PABs Issuer of its express obligations set out in a Financing Document to which it is a party;

b. a breach by the Enterprises of their express obligations to Lenders set out in the Lenders Direct Agreement;

c. a default by the Enterprises (including the PABs Issuer) of their express obligations set out in any continuing disclosure agreement related to the PABs to which either or both of them is or are a party; and

d. any Lender succeeding to the rights and interests of Developer hereunder pursuant to the Lenders Direct Agreement,

the Enterprises shall not have any obligation to any Lender and no Lender is entitled to seek any damages or other amounts from the Enterprises (and, in the case of an event specified in Section 27.4.4.a, then only from BE in its capacity as PABs Issuer), whether for Project Debt or any other amount. For certainty, the foregoing does not affect Enterprises' liability to Developer under Section 33 and Schedule 7 (*Compensation on Termination*) for the payment of any Termination Amount.

28. FINANCIAL MODEL

28.1. General

28.1.1. Whenever a Relevant Event occurs (except as otherwise provided in this Agreement or where the Parties mutually agree otherwise), the financial consequences of such event shall be determined pursuant to this Section 28.

28.1.2. Where, for the purposes of this Section 28, the Financial Model is to be used to make calculations related to, and/or to be adjusted by reference to, a Relevant Event, this shall be carried out by Developer, in consultation with the Enterprises, to reflect the impact of the Relevant Event in respect of which such calculations and/or adjustment is being undertaken.

28.1.3. In calculating any Change in Costs, Delay Financing Costs or Milestone Payment Delay Costs and in assessing other adjustments to be made to the Financial Model arising from a Relevant Event, Developer shall not be entitled to take into account the financial impact up to or after the date of the Relevant Event of those risks which Developer bears under the terms of this Agreement, including (to the extent so borne by Developer under this Agreement) changes in taxation rates, inflation and the impact of any deductions made by the Enterprises pursuant to Schedules 4 (*Payments*), 5 (*Milestone Payments*) and 6 (*Performance Mechanism*).

28.2. No Better and No Worse

Any reference in this Agreement to "No Better and No Worse" or to leaving Developer in a "No Better and No Worse position" shall be construed by reference to Developer's:

a. rights, duties and liabilities under or arising pursuant to the performance of this Agreement, the Financing Documents and the Principal Subcontracts; and

b. ability to perform its obligations and exercise its rights under this Agreement, the Financing Documents and the Principal Subcontracts,

so as to ensure that:

c. Developer is left in a position (ascertained in accordance with Section 28.2.d) which is financially no better and no worse in relation to the Key Ratios and the Equity IRR; and

d. such position shall be ascertained by determining through an adjustment to the Financial Model made pursuant to Sections 28.3 and 28.4 the adjustment or credit to the payments between the Parties hereunder required to maintain Developer in the financial position it would have been in under the version of the Financial Model applicable immediately prior to the relevant adjustment,

provided that, for the purposes of determining whether Developer was left in a No Better and No Worse position pursuant to any Section of this Agreement, any such adjustment or credit shall be reduced to take into account any Loss, suffered or incurred by Developer as a result of the occurrence of the relevant Supervening Event, in respect of which the Enterprises are not required to compensate Developer pursuant to this Agreement and/or any unrelated set-off by the Enterprises pursuant to Section 44.1.1.

28.3. Amendments to Logic and/or Formulae

28.3.1. Where it is necessary to amend the logic or formulae incorporated in the Financial Model to permit calculations and/or adjustments to be made as required by this Section 28, such amendments shall be made to the extent necessary.

28.3.2. If any amendment is to be made to the logic or formulae incorporated in the Financial Model pursuant to Section 28.3.1, the Financial Model shall first be run immediately prior to the making of any such amendment to ensure that the Key Ratios from the Financial Model are maintained at levels that are neither lower nor higher than the Key Ratios existing immediately after making such amendment, and the difference in the Equity IRR after and immediately prior to making such amendment does not differ by more than one basis point (being 0.01%).

28.4. Financial Model Audits and/or Accuracy

28.4.1. In connection with any adjustments made to the Financial Model, including amendments to the logic or formulae incorporated in the Financial Model as contemplated by Section 28.3, and as a condition to any Approval pursuant to Section 28.6, Developer shall deliver to the Enterprises (on a reliance basis) an audit of such amended version of the Financial Model from an independent audit firm that is unaffiliated with Developer, is otherwise free of any conflict of interest and has a nationally recognized reputation.

28.4.2. Developer shall bear the entire risk of any errors in or omissions from the Financial Model and shall not be entitled to any compensation or other relief from the Enterprises in relation to any Loss or damage that it suffers as a result of any such error or omission.

28.5. Copies of the Revised Financial Model

Following any adjustment or other revision to the Financial Model under the provisions of this Section 28 or pursuant to Section 29, Developer shall promptly deliver a copy of the revised Financial Model to the Escrow Agent pursuant to the Financial Model Escrow Agreement in the same form as the version delivered pursuant to Schedule 1 (*Financial Close*) prior to Financial Close.

28.6. Replacement of Financial Model

Any Financial Model produced following adjustments pursuant to this Section 28 shall, when it is Approved by the Enterprises, become the Financial Model for the purposes of this Agreement until any further amendment pursuant to this Section 28 or 29.

28.7. Financial Model License

a. Developer grants to the Enterprises a license to use the Financial Model commencing from its delivery pursuant to this Agreement to end of the Term or, if later, the date of full settlement of all mutual claims arising out of this Agreement that the Parties may have against each other if such a date occurs after the end of the Term, for any purpose in connection with this Agreement and/or the Project.

b. The license granted pursuant to Section 28.7.a shall not be transferable or assignable by the Enterprises except to CDOT or to any Person to whom this Agreement may be transferred in accordance with Section 39.2 and then only for purposes in connection with this Agreement and/or the Project.

29. REFINANCINGS

29.1. Enterprises' Approval, and Sharing in the Gains of Qualifying Refinancings

29.1.1. Developer shall not implement any Qualifying Refinancing without the prior Acceptance of the Enterprises.

29.1.2. Following the completion by Developer of any Enterprise Accepted Qualifying Refinancing, the Enterprises shall be entitled to collectively receive a 50% share of any Refinancing Gain arising therefrom, provided that the Enterprises shall not withhold or delay their Acceptance to a Qualifying Refinancing in order to obtain greater than such a 50% share of the Refinancing Gain.

29.2. Refinancing Details

29.2.1. Developer shall notify Enterprises of any Qualifying Refinancing at least 30 Working Days (or 15 Working Days, in case of a Rescue Refinancing) in advance of the date that is proposed that such Qualifying Refinancing or Rescue Refinancing, as applicable, becomes effective.

29.2.2. The notice to be provided by Developer referred to in Section 29.2.1 shall include details of any changes to Developer's obligations to the Lenders, details of the anticipated Refinancing Gain and details of changes or replacements to the Financing Documents, and shall include a copy of the proposed revised Financial Model relating to the proposed Refinancing (if any) and the basis for the assumptions used in the proposed Financial Model.

29.2.3. No later than 10 Working Days (or five Working Days, in the case of a Rescue Refinancing) after delivery of the notice by Developer to the Enterprises pursuant to Section 29.2.1, the Enterprises (following consultation with Developer and good faith consideration of Developer's reasonable recommendations regarding the sharing of any Refinancing Gain) shall notify Developer as to how Enterprises shall elect to receive its share of the Refinancing Gain pursuant to Section 29.3. No later than 10 Working Days (or five Working Days, in the case of a Rescue Refinancing) after delivery of such notice to Developer, Developer shall deliver to the Enterprises a detailed update to its original notice referred to in Section 29.2.1 reflecting any adjustments to the proposed revised Financial Model necessary to take account of the Enterprises' election. With the Enterprises' Approval, such revised Financial Model shall become the Financial Model for purposes of this Agreement until any further amendment pursuant to Section 28 or this Section 29.

29.2.4. The Enterprises shall (before, during and at any time after any Refinancing) have unrestricted rights of audit over any Financial Model and documentation (including any aspect of the calculation of the Refinancing Gain) used in connection with that Refinancing, whether or not the Refinancing is a Qualifying Refinancing, provided that:

a. Developer shall reimburse the Enterprises for all reasonable costs and expenses incurred in conducting any such audit in respect of a Qualifying Refinancing, and such costs and expenses shall be taken into account when calculating the Refinancing Gain; and

b. the Enterprises shall reimburse Developer for all reasonable costs and expenses incurred in conducting any such audit in respect of a Refinancing that is not and, prior to such audit, was known by the Enterprises to not be a Qualifying Refinancing.

29.3. Receipt of Enterprises' Share

The Enterprises shall have the right to elect to receive their share of any Refinancing Gain described in Section 29.1.2 as either:

a. to the extent Developer receives a lump sum payment as a result of the Qualifying Refinancing, a lump sum payment, to be paid promptly and in any event no later than five Working Days following the relevant Distribution;

b. a reduction in the Performance Payments over the remainder of the Term in a manner to be determined by the Enterprises provided that Developer is left in a No Better and No Worse position (after taking into account Developer's share of the relevant Refinancing Gain); or

c. a combination of paragraphs a. and b.

29.4. Costs

The Refinancing Gain shall be calculated after taking into account the reasonable and proper professional costs that each Party directly incurs in relation to the Qualifying Refinancing and on the basis that all reasonable and proper professional costs incurred by the Enterprises shall be paid to the Enterprises by Developer no later than 20 Working Days after any Qualifying Refinancing.

29.5. Notifiable Refinancings

Without prejudice to the other provisions of this Section 29, Developer shall notify the Enterprises of all Notifiable Refinancings on becoming aware of the same and again when they are entered into and provide full details of the same within 30 Calendar Days of the date the relevant agreements for the Notifiable Refinancing are entered into.

29.6. Delivery of Changed Financing Documents

At any time an amendment is made to any Financing Document or Developer enters into a new Financing Document (or any agreement which affects the interpretation or application of any Financing Document), Developer shall deliver to the Enterprises a conformed copy of each such amendment or agreement within 10 Working Days of the date of its execution or creation (as applicable) certified as a true copy by an officer of Developer.

30. TAXES

30.1.1. Developer shall pay, prior to delinquency, all Taxes, including, for certainty, all Ad Valorem and Possessory Interest Taxes and all State Sales Taxes, in each case in respect of Developer's performance of the Work, Developer's obligations under this Agreement, Developer's interests in and rights to the Site and the Project License and any other Developer-Related Entity interest in this Agreement and the Project. Subject to Section 30.1.6 and Developer's rights arising as a result of the occurrence of any Compensation Event as described in paragraph c.i. of the definition thereof in Part A of Annex A (*Definitions and Abbreviations*), the Enterprises shall not be responsible for any Taxes levied on Developer or on any other Developer-Related Entities.

30.1.2. Subject to Section 30.1.6, Developer accepts sole responsibility for, and agrees that it shall have no right to claim a Supervening Event or to any other Claim for relief due to, its misinterpretation of Laws in relation to Taxes or incorrect assumptions regarding applicability of Taxes.

30.1.3. Developer shall promptly notify the Enterprises after it becomes aware that it (or any other Developer-Related Entity) may be legally obligated to pay:

a. any:

i. ad valorem property tax imposed by a Governmental Authority under the laws of the State; or

ii. possessory interest property tax pursuant to Articles 1-14 of Title 39, C.R.S. (including, for certainty, C.R.S. § 39-1-103 (17)),

(each an "Ad Valorem and Possessory Interest Tax"); or

b. any sales and use tax ("State Sales Tax") imposed by the State under the laws of the State (excluding, for certainty, any sales and use tax imposed by the City of Denver or any other Governmental Authority that is not the State),

in each case in connection with the Work and the Project.

30.1.4. Developer shall:

a. cooperate and coordinate with the Enterprises in their efforts to reduce or eliminate Developer's liability for any Ad Valorem and Possessory Interest Tax and State Sales Tax for which the Enterprises otherwise would be obligated to reimburse Developer pursuant to Section 30.1.6; and

b. use (and ensure that each other relevant Developer-Related Entity uses) Reasonable Efforts to mitigate the imposition and amount of the relevant Tax,

provided that Developer shall not be required to disclose any Project Records to the applicable Governmental Authority when complying with its obligations under this Section 30.1.4 to the extent such records are identified as exempt from disclosure under such circumstances in the disclosure protocol Accepted by the Enterprises pursuant to Section 20.1.2.

30.1.5. Following Developer's decision not to disclose any Project Record pursuant to Section 30.1.4, Developer shall assume the Enterprises' efforts to reduce or eliminate Developer's liability for any State Sales Tax and the Enterprises shall be relieved of their obligation to reimburse Developer pursuant to Section 30.1.6 with respect to such State Sales Tax.

30.1.6. Subject to Section 30.1.5, the Enterprises shall reimburse Developer for the actual amount of any Ad Valorem and Possessory Interest Tax and State Sales Tax paid by Developer or any other Developer-Related Entity in connection with the Work and the Project, excluding any such Tax imposed or owing as a result of any breach of Law, Governmental Approval, Permit or this Agreement, fraud, willful misconduct, criminal conduct, recklessness, bad faith or negligence by or of any Developer-Related Entity no later than the date that is 45 Calendar Days after the Enterprises' receipt of a demand for such reimbursement (or, provided that such 45 Calendar Day period has expired, no later than 10 Working Days prior to the final date by which Developer is legally obligated to pay such Tax), which demand shall include:

a. all supporting evidence necessary to substantiate such demand, including, in the case of any State Sales Tax, evidence that Developer or any relevant Developer-Related Entity submitted the requisite State Sales Tax exemption certificate for the transaction in question; and

b. evidence of Reasonable Efforts by Developer and any other relevant Developer-Related Entities to mitigate the imposition and amount of the relevant Tax,

and satisfaction of both paragraphs a. and b. shall be conditions precedent to the Enterprises' reimbursement payment to Developer.

31. RESTRICTIONS ON REVENUE GENERATING ACTIVITIES

31.1. Restrictions on Tolling

31.1.1. The Enterprises (and CDOT) have exclusive rights to impose tolls or any other user fees (in any form) in relation to the Project, including the right to deposit and allocate any resulting revenues as they determine in their discretion.

31.1.2. Developer hereby acknowledges and agrees that:

a. it has no right to:

i. impose tolls or any other user fees (in any form) in relation to the Project; or

ii. directly or indirectly engage in any revenue generating business on any part of the Site in connection with the Project, other than the conduct of its business pursuant to Section 8.1.2.b and the revenues it receives from the Enterprises pursuant to this Agreement;

b. it will not have any lien over or security interest in any toll revenues, user fees or other revenues generated by the Enterprises, CDOT or other Persons on any part of the Site or in connection with the Project.

31.2. Restrictions on Advertising

31.2.1. The Enterprises retain all rights relating to approving, planning and/or selling advertising on the Right-of-Way, any Additional Right-of-Way and any other Assets, and otherwise in connection with the Project.

31.2.2. Developer shall:

a. use Reasonable Efforts to cooperate with; and

b. without prejudice to Developer's rights arising as a result of the occurrence of any Compensation Event as described in paragraphs b.iv. and g.iii. of the definition thereof in Part A of Annex A (*Definitions and Abbreviations*), grant all necessary access to,

the Enterprises and any Person authorized by the Enterprises in connection with the exercise of the Enterprises' retained rights under Section 31.2.1.

PART K: DEFAULTS, REMEDIES AND TERMINATION

32. DEFAULTS AND REMEDIES

32.1. Developer Defaults and Cure Periods

32.1.1. The occurrence of any one of the events set out in the column titled "Developer Default" in the table below shall constitute a "Developer Default". For purposes of this Agreement, "Developer Default Cure Period" means, in respect of a Developer Default, the cure period (if any) specified in the column titled "Cure Period" in the table below in the same row as such Developer Default, subject to extension in accordance with Section 32.1.2.

Developer Defaults

Developer Default	Cure Period
(1) An Insolvency Event occurs in respect of Developer.	None.
(2) An Insolvency Event occurs in respect of a Required Guarantor unless, within 90 Calendar Days after the occurrence of such Insolvency Event: (a) Developer has: (i) replaced such Insolvent Required Guarantor with a guarantor that is Accepted by the Enterprises; or (ii) provided security for such Insolvent Required Guarantor's guaranty in the form of a cash deposit, other payment or letter of credit in each case in an amount equal to the specified sum or specified maximum liability (or, absent such specified sum or maximum liability, the reasonably estimated maximum liability) under its guaranty; or (b) such Insolvent Guarantor has ceased to be a Required Guarantor.	
(3) An Insolvency Event occurs in respect of a Principal Subcontractor (or any Required Principal Subcontractor Member thereof) whose Work is not completed at the time of such occurrence, unless within 90 Calendar Days after the occurrence of such Insolvency Event: (a) Developer has replaced such Insolvent Principal Subcontractor (or such Insolvent Required Principal Subcontractor Member) with a party Accepted by the Enterprises; or (b) any such Insolvent Required Principal Subcontractor Member has ceased to be a Required Principal Subcontractor Member.	
(4) With respect to any Principal Subcontract pursuant to which Work remains to be performed, Developer fails to enter into: (a) a replacement Principal Subcontract Accepted by the Enterprises pursuant to Section 17.1.3.b and related guaranty (if any) with a counterparty and a Required Guarantor (if any) Accepted by the Enterprises within 90 Calendar Days after termination of such Principal	

Developer Default	Cure Period
Subcontract; or (b) a replacement guaranty Acceptable to the Enterprises within 90 Calendar Days after termination of a guaranty from a Required Guarantor related to a Principal Subcontract that has not also been terminated. (5) The Substantial Completion Date does not occur on or prior to the Longstop Date. (6) A Noncompliance Default Event occurs. (7) A Closure Default Event occurs. (8) A Persistent Breach occurs. (9) Any Developer-Related Entity commits a Prohibited Act and such entity is: (a) Developer; or (b) any other Developer-Related Entity: (i) acting in concert with Developer; or (ii) acting independently of Developer, but with Developer's prior knowledge, unless Developer promptly notifies the Enterprises and, as required by Law, any other relevant Governmental Authorities of such Prohibited Act (in which case Developer Default number (22) in this Section 32.1.1 shall apply with respect to such Prohibited Act). (10) After exhaustion of all rights of appeal, there occurs any disqualification, suspension or debarment from bidding, proposing or contracting with any state-level, interstate or Federal Governmental Authority (distinguished from ineligibility due to lack of financial qualifications) (any such event, an "Exclusion") of: (a) Developer; (b) any Equity Member that remains an Equity Member 60 Calendar Days after the date of the relevant Exclusion; (c) any Principal Subcontractor whose work is not completed at the date of the relevant Exclusion that is not replaced with a contractor Accepted by the Enterprises within 90 Calendar Days after the date of the relevant Exclusion; (d) any Guarantor or any member of any Principal Subcontractor whose work is not completed at the date of the relevant Exclusion that is not: (i) replaced with a Guarantor or member Accepted by the Enterprises; or (ii) removed without replacement on the basis that at the relevant time such Guarantor or member was	

Developer Default	Cure Period
not a Required Guarantor or Required Principal Subcontractor Member, in either case within 90 Calendar Days after the date of the relevant Exclusion; or (e) any other Developer-Related Entity whose work is not completed at the date of the relevant Exclusion and that remains a Developer-Related Entity 90 Calendar Days after the date of the relevant Exclusion. (11) A Developer Default occurs pursuant to Section 26.2.1. (12) Developer makes or permits a transfer or assignment in breach of Section 39.1. (13) Developer fails to procure or maintain any Contractor Bond required to be procured and maintained pursuant to Sections 9.3.1 and 9.3.2 (other than due to the provider of any such bond ceasing to qualify as an Eligible Surety or an Eligible Financial Institution). (14) Developer fails to obtain and maintain, or cause to be obtained and maintained, any Insurance Policy in full compliance with, and as and when required under, this Agreement (other than any non-material deviation from the requirements of this Agreement pertaining to the amounts or terms of such Insurance Policy) and such failure continues for 15 Calendar Days.	
(15) Developer fails to comply with any Safety Compliance Order pursuant to Section 23.1.3 and such failure directly results in a material and ongoing risk to: (a) the health or safety of any person; (b) the Environment; (c) Improvements; (d) the community; or (e) property. (16) If Developer has elected pursuant to Section 4.5 of Schedule 12 (*Handback Requirements*) to provide a Handback Letter of Credit, Developer fails to maintain such Handback Letter of Credit in full compliance with the requirements of that Section 4.5: (a) due to the provider of any such Handback Letter of Credit ceasing to qualify as an Eligible Financial Institution, and Developer fails to procure a replacement Handback Letter of Credit within 15 Calendar Days after the provider ceases to so qualify; or (b) for any reason, other than that specified in Developer Default number (16)(a) in this Section 32.1.1, provided that no such failure shall constitute a Developer Default if such failure occurs and is continuing during the Handback Reserve Standstill Period.	15 Calendar Days after the date on which the Enterprises deliver notice to Developer of the occurrence of the relevant Developer Default.

Developer Default	**Cure Period**
(17) Unless Developer has delivered a Handback Letter of Credit that complies with the requirements of Section 4.5 of Schedule 12 (*Handback Requirements*), the amount standing to the credit of the Handback Reserve Account at any time after the commencement of the Handback Period is less than the Handback Reserve Amount, provided that no such failure shall constitute a Developer Default if such failure occurs and is continuing during the Handback Reserve Standstill Period. (18) Developer fails to procure a replacement Contractor Bond pursuant to Sections 9.3.1 and 9.3.2 within 15 Calendar Days after the provider of any such Contractor Bond ceases to qualify as an Eligible Surety or an Eligible Financial Institution.	
(19) A breach of Federal Law or any requirement that in either case, pursuant to the express terms of Schedule 15 (*Federal and State Requirements*), gives rise to a default (excluding, for certainty, a default pursuant to Section 5.4 of Schedule 15 (*Federal and State Requirements*)) that may subsequently result in termination of this Agreement by the Enterprises. (20) Developer fails to make any payment to the Enterprises pursuant to or in relation to this Agreement when due (unless such payment is the subject of a good faith Dispute). (21) An Abandonment occurs. (22) Any Developer-Related Entity (other than Developer): (a) not acting in concert with Developer; or (b) acting independently of Developer to the extent that Developer Default number (9) in this Section 32.1.1 does not apply; commits a Prohibited Act and: (i) any Equity Member or any Indirect Equity Member that remains an Equity Member or any Indirect Equity Member, as applicable, 60 Calendar Days after the occurrence of the relevant Prohibited Act; (ii) with respect to any Principal Subcontractor whose work is not completed when the relevant Prohibited Act occurs, such Principal Subcontractor is not replaced with a contractor Accepted by the Enterprises within 90 Calendar Days after the occurrence of the relevant Prohibited Act; (iii) Guarantor or any member of any Principal Subcontractor whose work is not completed at the date of the relevant Prohibited Act: (A) is not replaced with a Guarantor or member Accepted by the Enterprises; or (B) removed without replacement on the basis that at the relevant time such Guarantor or	30 Calendar Days after the date on which the Enterprises deliver notice to Developer of the occurrence of the relevant Developer Default.

Developer Default	Cure Period
member was not a Required Guarantor or Required Principal Subcontractor Member, in either case within 90 Calendar Days after the date of the Prohibited Act; or (iv) with respect to any other Developer-Related Entity, remains a Developer-Related Entity 30 Calendar Days after the occurrence of the relevant Prohibited Act.	
(23) An Organizational Conflict of Interest was known, or should have been known, and was not disclosed to the Enterprises pursuant to the ITP before the Agreement Date. (24) Developer fails to comply with any Governmental Approval, Permit or Law, or any Environmental Requirement, in any such case in any material respect. (25) Developer fails to comply with any requirement of this Agreement pertaining to the amounts, terms, coverage documentation or evidencing of any Insurance Policy, other than: (a) with respect to any failure to submit documents verifying insurance coverage and payment of insurance premiums and renewals that constitutes a Noncompliance Event; or (b) with respect to any failure that results in a Developer Default number (14) in this Section 32.1.1.	30 Calendar Days (subject to extension in accordance with Section 32.1.2.a) after the date on which the Enterprises deliver notice to Developer of the occurrence of the relevant Developer Default.
(26) During the Restricted Transfer Period, an Insolvency Event occurs in respect of any Equity Member and continues for 45 Calendar Days, unless such Equity Member has fully met all financial obligations owing to Developer by providing a Committed Investment and payments or transfers of money or property previously made to or for the benefit of Developer are not subject to any Law respecting the avoidance or recovery of preferences for fraudulent transfers. (27) Subject to Section 5.4, any representation or warranty in this Agreement made by Developer pursuant to this Agreement, or in any certificate, schedule, report, instrument, agreement or other document delivered by or on behalf of Developer to the Enterprises pursuant to this Agreement, is false, misleading or inaccurate in any material respect when made or omits material information when made. (28) A violation by Developer of Section 53.5. (29) A breach by Developer of any of its material obligations under this Agreement, including any written repudiation of this Agreement, other than any breach that: (a) constitutes a Developer Default under any other paragraph of this Section 32.1.1; (b) constitutes a Noncompliance Event; (c) results in the accrual of a Construction Closure	45 Calendar Days (subject to extension in accordance with Section 32.1.2.a) after the date on which the Enterprises deliver notice to Developer of the occurrence of the relevant Developer Default.

Developer Default	Cure Period
Deduction or an Operating Period Closure Deduction; or (d) arises due to a Relief Event or Compensation Event.	

32.1.2. For purposes of determining when any applicable Developer Default Cure Period has expired or when a cure of any relevant Developer Default has been effected the following provisions of this Section 32.1.2 shall apply:

a. with respect to any Developer Default number (23), (24), (25), (26), (27), (28) or (29) in Section 32.1.1 that requires a longer period to cure than the applicable Developer Default Cure Period, if Developer has within 10 Calendar Days of the start of the relevant Developer Default Cure Period submitted a rectification plan to the Enterprises for Acceptance, then such Developer Default Cure Period shall be extended so that it expires on the earliest of:

i. the later of the date on which the Enterprises reject such plan and the end of the Developer Default Cure Period absent any extension;

ii. the latest date reasonably necessary to effect the cure thereof as set out in the Accepted plan;

iii. if there is an Accepted plan, 120 Calendar Days after the date of the start of the applicable Developer Default Cure Period; or

iv. the date on which Developer ceases its good faith efforts to cure such Developer Default in accordance with the Accepted plan;

b. without prejudice to Section 32.1.2.a, with respect to the Developer Default number (27) in Section 32.1.1, the cure will be complete when all necessary disclosures have been made and all adverse effects (if any) caused by the incorrect disclosure have been cured;

c. with respect to any Developer Default number (9), (10), (22) or (23) in Section 32.1.1, the cure must be Accepted by the Enterprises;

d. with respect to Developer Default number (14), (18) or (25) in Section 32.1.1, the Enterprises shall have the right, but not the obligation, to effect a cure, at Developer's expense, if such a Developer Default continues after the end of the applicable Developer Default Cure Period; and

e. any requirement of prior notice of Developer Default from the Enterprises to Developer to initiate the applicable Developer Default Cure Period shall be automatically waived if:

i. Developer knew that the relevant Developer Default had occurred;

ii. Developer failed to notify the Enterprises of the relevant Developer Default;

iii. Developer knew (or reasonably should have anticipated) that as a result of such failure the Enterprises would not know of such Developer Default; and

iv. at the relevant time, the Enterprises did not know of the relevant Developer Default,

in which case the applicable Developer Default Cure Period shall start on the date that Developer first knew that the relevant Developer Default had occurred.

32.2. Enterprises Remedies for Developer Default

32.2.1. If any Developer Default occurs and has not been cured by the expiry of the applicable Developer Default Cure Period, the Enterprises may in their discretion, subject to the Lenders' rights pursuant to the Lenders Direct Agreement, exercise any rights and remedies available to them

(under this Agreement, at Law or otherwise) for so long as such Developer Default continues uncured, including:

a. terminating this Agreement pursuant to Section 33.1.3;

b. exercising their rights of self-help pursuant to Sections 23.4.2 to 23.4.4 as provided in Section 23.4.1.b;

c. by notice to Developer, granting Developer an extended Developer Default Cure Period (in addition to any other extension pursuant to Section 32.1.2.a) which grant may be made subject to such conditions as the Enterprises may require in their discretion;

d. making a demand upon and enforcing any Contractor Bond in accordance with its terms, with the proceeds of any such action to be applied to the satisfaction of Developer's obligations under this Agreement, including payment of amounts due to the Enterprises; and/or

e. waiving such default in accordance with Section 43.3.

32.2.2. The Enterprises' rights and remedies with respect to the occurrence of any Developer Default are without limitation to its rights and remedies with respect to the occurrence of any other Developer Default.

32.3. Enterprise Defaults and Cure Periods

32.3.1. The occurrence of any one of the events set out in the column titled "Enterprise Default" in the table below shall constitute an "Enterprise Default". For purposes of this Agreement, "Enterprise Default Cure Period" means, in respect of an Enterprise Default, the cure period specified in the column titled "Cure Period" in the table below in the same row as such Enterprise Default, subject to extension in accordance with Section 32.3.2.

Enterprise Defaults

Enterprise Default	Cure Period
(1) Either Enterprise fails to comply with its obligation under Section 11.2.2 and, as a result of such failure, such Enterprise fails to qualify as a government-owned business within CDOT or an enterprise under Article X, Section 20 of the State Constitution with respect to the current Contract Year and such failure is subsequently determined to have continued with respect to the following Contract Year.	None.
(2) The Enterprises fail to make any payment to Developer under this Agreement when due (unless such payment is the subject of a good faith Dispute).	15 Calendar Days with respect to Milestone Payments, and 30 Calendar Days with respect to all other payments, in each case after the date on which Developer delivers notice to the Enterprises of the occurrence of the relevant Enterprise Default.
(3) Either of the Enterprises, CDOT, the State or any other Governmental Authority confiscates, sequesters, condemns or appropriates all or a material part of:	30 Calendar Days after the date on which Developer delivers notice to the

Enterprise Default	Cure Period
(a) the Project; (b) the Assets; (c) ownership interests in Developer; (d) Developer's interests in this Agreement, excluding the exercise of any right of termination pursuant to this Agreement. (4) BE fails to comply with its obligation under Section 11.2.1. (5) The Enterprises fail to comply with their obligations under Section 11.2.3.a.	Enterprises of the occurrence of the relevant Enterprise Default.
(6) The Enterprises fail to comply with their obligations under Section 11.2.3.b. (7) Either Enterprise makes an assignment or transfer in breach of Section 39.2. (8) A breach or breaches by either Enterprise of any of its or their obligations under this Agreement (other than any breach or breaches that constitute an Enterprise Default under any other paragraph of this Section 32.3.1) that (in the case of more than one breach, when taken together) substantially frustrates or renders it impossible for Developer to perform all or a substantial part of its obligations or to exercise all or a substantial part of its rights under this Agreement in each case for a continuous period of 60 Calendar Days.	45 Calendar Days after the date on which Developer delivers notice to the Enterprises of the occurrence of the relevant Enterprise Default.
(9) Subject to Section 5.4, any representation or warranty made by either Enterprise pursuant to Section 5.1.2 is false, misleading or inaccurate in any material respect when made or omits material information when made.	60 Calendar Days after the date on which Developer delivers notice to the Enterprises of the occurrence of the relevant Enterprise Default.

32.3.2. For purposes of determining when any applicable Enterprise Default Cure Period has expired or when a cure of any relevant Enterprise Default has been effected, the following provisions of this Section 32.3.2 shall apply:

a. with respect to any Enterprise Default number (6) or (9) in Section 32.3.1 that, in the Enterprises' reasonable determination, requires a longer period to cure than the applicable Enterprise Default Cure Period, if the Enterprises have within the relevant Enterprise Default Cure Period notified Developer of such determination, then, provided that (I) the Enterprises have taken meaningful steps to cure such Enterprise Default before triggering such extension and (II) the Enterprises proceed diligently to cure such Enterprise Default after such extension is made, such Enterprise Default Cure Period shall be extended to the earliest of:

i. the latest date reasonably necessary to effect the cure; or

ii. with respect to:

A. any Enterprise Default number (6) in Section 32.3.1, 45 Calendar Days after the date of the end of the applicable Enterprise Default Cure Period; and

B. any Enterprise Default number (9) in Section 32.3.1, 130 Calendar Days after the date of the end of the applicable Enterprise Default Cure Period

b. with respect to Enterprise Default number (9) in Section 32.3.1, the cure will be complete when all necessary disclosures have been made and all adverse effects (if any) caused by the incorrect disclosure have been cured.

32.4. Developer Remedies for Enterprise Default

32.4.1. If any Enterprise Default occurs and has not been cured within the applicable Enterprise Default Cure Period, Developer may in its discretion:

a. terminate this Agreement pursuant to Section 33.1.4;

b. by notice to the Enterprises, grant the Enterprises an extended Enterprise Default Cure Period (in addition to any other extension pursuant to Section 32.3.2); and/or

c. waive such default in accordance with Section 43.3.

32.4.2. Developer's rights and remedies with respect to the occurrence of any Enterprise Default are without limitation to its rights and remedies with respect to the occurrence of any other Enterprise Default.

33. TERMINATION

33.1. Termination Events

33.1.1. Exclusive Rights to Terminate

a. Prior to Financial Close, the Parties' sole right to terminate this Agreement shall be pursuant to Schedule 1 (*Financial Close*). On and from the Financial Close, this Agreement is subject to termination pursuant to Sections 33.1.2 through 33.1.7.

b. This Section 33, together with the other provisions of this Agreement expressly referred to in this Section 33 and the provisions of the Lenders Direct Agreement, contain the entire and exclusive provisions and rights of the Enterprises and Developer regarding termination of this Agreement, and any and all other rights to terminate at Law or in equity are hereby waived to the maximum extent permitted by Law, provided that termination of this Agreement shall not relieve Developer, or any Guarantor, insurer or any surety or other financial institution that provides a Contractor Bond, of its obligation for any Claims arising prior to termination.

33.1.2. Termination for Convenience

a. The Enterprises may, in their discretion (subject to prior notice in accordance with Section 33.1.2.b and to Section 33.1.2.d), terminate this Agreement at any time on or before the Expiry Date by delivering to Developer a Termination Notice to such effect (a "Termination for Convenience").

b. Any such Termination for Convenience shall be effective 30 Calendar Days from the date of the Termination Notice, or on such later date as the Enterprises may specify in such notice.

c. As a consequence of a Termination for Convenience, the Enterprises shall pay the Termination Amount to Developer as determined pursuant to Section 1 of Schedule 7 (*Compensation on Termination*).

d. The Enterprises shall only be entitled to exercise their discretion to terminate this Agreement pursuant to Section 33.1.2.a if at such time they have a reasonable expectation that they will be able to pay such Termination Amount in full no later than the date determined pursuant to Section 4.2 of Schedule 7 (*Compensation on Termination*).

e. On or about the date of a Termination Notice delivered pursuant to Section 33.1.2.a (and, in any event, prior to the Termination Date), the Enterprises shall deliver to Developer a

written summary of the basis for their reasonable expectation referenced in Section 33.1.2.d.

33.1.3. Termination for Developer Default

a. If a Developer Default occurs and has not been cured within the applicable Developer Default Cure Period, the Enterprises may, in their discretion and subject to prior notice in accordance with Section 33.1.3.b and the Lenders' rights pursuant to the Lenders Direct Agreement, terminate this Agreement at any time that such default is continuing by delivering to Developer a Termination Notice to such effect.

b. Subject to the Lenders Direct Agreement, any such termination for Developer Default shall be effective 30 Calendar Days from the date of the Termination Notice, or on such later date as the Enterprises may specify in such notice.

c. As a consequence of any termination for Developer Default, the Enterprises shall pay the Termination Amount to Developer as determined pursuant to Section 3 of Schedule 7 (*Compensation on Termination*).

33.1.4. Termination for Enterprise Default

a. If an Enterprise Default occurs and has not been cured within the applicable Enterprise Default Cure Period, Developer may, in its discretion and subject to prior notice in accordance with Section 33.1.4.b, terminate this Agreement at any time that such default is continuing by delivering to the Enterprises a Termination Notice to such effect.

b. Any such termination for Enterprise Default shall be effective 30 Calendar Days from the date of the Termination Notice.

c. As a consequence of any termination for Enterprise Default, the Enterprises shall be obligated to pay the Termination Amount to Developer as determined pursuant to Section 1 of Schedule 7 (*Compensation on Termination*).

33.1.5. Termination by Court Ruling

a. Any Termination by Court Ruling shall become effective and automatically terminate Agreement upon issuance of the final, non-appealable court order by a court of competent jurisdiction.

b. As a consequence of any Termination by Court Ruling, excluding any such event that arises by reason of a Developer Default or an Enterprise Default, the Enterprises shall pay the Termination Amount to Developer as determined pursuant to Section 2 of Schedule 7 (*Compensation on Termination*).

c. As a consequence of any Termination by Court Ruling that arises by reason of a Developer Default or an Enterprise Default, the Enterprises shall pay the Termination Amount to Developer pursuant to Section 33.1.3.c or Section 33.1.4.c, as applicable.

33.1.6. Termination for Extended Events

a. If any of the following conditions is satisfied:

i. any single:

A. Force Majeure Event; or

B. Relief Event as described in paragraphs c., f., h. or l. of the definition thereof in Part A of Annex A (*Definitions and Abbreviations*),

causes one or both Parties to be unable to comply with its or their material obligations with respect to all or a material portion of the Project or the Work and such event and inability continues for a continuous period of at least 180 Calendar Days;

ii. any single Relevant Event results in a Milestone Delay Period of more than 365 Calendar Days, where for purposes of this Section 33.1.6.a.ii only:

A. all Compensation Events as described in paragraphs f.i. and f.ii.A. of the definition thereof in Part A of Annex A (*Definitions and Abbreviations*) shall collectively be deemed to be a single Compensation Event; and

B. all Compensation Events as described in paragraph f.iii. of the definition thereof in Part A of Annex A (*Definitions and Abbreviations*) shall collectively be deemed to be a single Compensation Event; or

iii. all:

A. Force Majeure Events;

B. Relief Events as described in paragraphs c., f., h. or l. of the definition thereof in Part A of Annex A (*Definitions and Abbreviations*); and

C. Relevant Events,

collectively result in a Milestone Delay Period of more than 730 Calendar Days,

then either Party may in its discretion, subject to Sections 33.1.6.b, 33.1.6.c and 33.1.6.d, terminate this Agreement at any time thereafter:

iv. during the continuation of the relevant event referred to in Section 33.1.6.a.i or Section 33.1.6.a.ii; or

v. during the continuation of the Milestone Delay Period,

(any such event referred to in iv. and any such continuation referred to in v., an "Extended Event") by delivering to the other Party a Termination Notice to such effect (a "Termination for Extended Events").

b. Notwithstanding Section 33.1.6.a, the Enterprises shall not be entitled to initiate a Termination for Extended Events in connection with any Extended Event that arises as a result of a Compensation Event as described in paragraphs a., b., g., i.i., j., k., l., m. or o. of the definition thereof in Part A of Annex A (*Definitions and Abbreviations*).

c. Any Termination for Extended Events shall be effective 30 Calendar Days from the date of the Termination Notice, provided that the Enterprises may, in their discretion (and without prejudice to the Enterprises' right to subsequently issue a Termination Notice pursuant to Section 33.1.6.a at any time thereafter with respect to such Extended Event to the extent then continuing), reject any Termination Notice delivered by Developer within 10 Working Days of receipt, in which case:

i. if such Termination Notice was delivered by Developer during the Construction Period and:

A. such Termination Notice was delivered as a result of satisfaction of any condition described in Section 33.1.6.a.i or Section 33.1.6.a.ii and the relevant Extended Event was a Force Majeure Event or a Relief Event (and not a Compensation Event), then such Extended Event shall constitute a Compensation Event from the date of the Termination Notice;

B. such Termination Notice was delivered as a result of satisfaction of the condition described in Section 33.1.6.a.ii and the relevant Extended Event was caused by the occurrence of either:

I. one or more Compensation Events referred to in Section 33.1.6.a.ii.A; or

II. one or more Compensation Events referred to in Section 33.1.6.a.ii.B,

then, with respect to any then continuing individual such Compensation Event, any resulting Change in Costs shall be determined in accordance with paragraph a. of the definition thereof in Part A of Annex A (*Definitions and Abbreviations*) (and not, respectively, paragraphs b. or c. of such definition) from the date of the Termination Notice; and

C. such Termination Notice was delivered as a result of satisfaction of the condition described in Section 33.1.6.a.iii:

I. any Milestone Payment Delay Costs otherwise payable with respect to any continuing Compensation Event or Delay Relief Event shall include principal in addition to interest from the date of the Termination Notice; and

II. to the extent that the satisfaction of such condition resulted from the continuation of a Force Majeure Event and/or a Relief Event (which is not also a Delay Relief Event), the relevant ongoing event(s) and any subsequent such event(s) shall constitute Delay Relief Event(s) from the date of the Termination Notice (and, in such event, any Milestone Payment Delay Costs payable with respect thereto shall include principal in addition to interest pursuant to Section 33.1.6.c.i.C.I); and

ii. if such Termination Notice was delivered by Developer during the Operating Period, the Enterprises shall pay to Developer in respect of the period from the date of the Termination Notice:

A. monthly Performance Payments as if the Work was being fully performed during such period pursuant to the requirements of this Agreement (net of (I) the actual avoidable costs of Work not being performed as a result of the occurrence of such Extended Event, (II) the amount that Developer is (or, pursuant to Section 35.5.a, should be) entitled to recover under any "business interruption" coverage under the Available Insurance and (III) any Monthly Performance Deductions that the Enterprises are otherwise entitled to make pursuant to Schedule 6 (*Performance Mechanism*); plus

B. all other Losses incurred during such period (to the extent not covered by insurance proceeds) as a result of any damage or delay (including demobilization and remobilization costs) resulting from such Extended Event; and

iii. Developer shall remain responsible for the continuation of the Work to the extent not relieved of its obligations pursuant to Section 15.3.1.a as a result of the occurrence of such Extended Event.

d. As a consequence of any Termination for Extended Events, the Enterprises shall pay the Termination Amount to Developer as determined pursuant to Section 2 of Schedule 7 (*Compensation on Termination*).

33.1.7. Termination for Uninsurable Risk

a. The Enterprises may, in their discretion and subject to prior notice in accordance with Section 33.1.7.b, terminate this Agreement at any time that they have the right to do so pursuant to Section 25.6.1.b.ii.A by delivering to Developer a Termination Notice to such effect.

b. Subject to Section 33.1.7.c, any such termination shall be effective 30 Calendar Days from the date of the Termination Notice. As a consequence of any termination pursuant to this Section 33.1.7, the Enterprises shall be obligated to pay the Termination Amount to Developer as determined pursuant to Section 2 of Schedule 7 (*Compensation on Termination*).

c. Notwithstanding the Enterprises' delivery of a Termination Notice pursuant to Section 33.1.7.a, Developer may choose to continue this Agreement by delivering a notice to the Enterprises within the 30 Calendar Day period specified in Section 33.1.7.b, following which:

i. Developer shall, as a condition to effectiveness of its notice (unless such condition is waived on the basis that Developer will self-insure the relevant risk with the Enterprises' Approval), deliver to the Enterprises a cash deposit or an irrevocable on demand letter of credit from an Eligible Financial Institution in either case equal to the Enterprises' reasonable estimate of the aggregate of:

A. the maximum amount that the Enterprises could be obligated to pay Developer under Section 25.6.1.b.ii.B as a result of the relevant risk being Uninsurable (such amount to be held and disbursed in place of insurance proceeds by the Enterprises upon the occurrence of the relevant risk); plus

B. the maximum amount of Enterprise and CDOT Losses that would have been compensable by insurance proceeds payable under the relevant Insurance Policy had the relevant risk not become Uninsurable (such amount to be held and retained by the Enterprises),

subject to the Enterprises' obligation to return such deposit or letter of credit (less amounts used or drawn) to Developer promptly after the relevant risk ceases to be Uninsurable and becomes insured under an Insurance Policy; and

ii. the Enterprises' Termination Notice shall have no further effect.

33.2. Consequences of Termination

On the Termination Date as determined pursuant to Sections 33.1.2 through 33.1.7, this Agreement shall automatically terminate.

33.3. No Increased Termination Liabilities

a. Notwithstanding any other provision of this Agreement, but subject to Section 33.3.b:

i. no otherwise effective amendment or waiver of any provision of, or exercise of any right under:

A. any Principal Subcontract;

B. any other Subcontract to which Developer is a party; or

C. any Financing Document; and

ii. no otherwise effective Refinancing,

shall, as between the Enterprises and Developer, have the effect of increasing the amount of the Enterprises' termination liabilities as of the Termination Date as reflected in any Termination Amount.

b. Section 33.3.a shall not apply with respect to any such amendment, waiver, exercise of any right or any Refinancing:

i. to the extent such constitutes:

A. an amendment or waiver of any provision of any Principal Subcontract, or any other Subcontract to which Developer is a party, to the extent necessary to reflect a corresponding amendment to, or Change under, this Agreement;

B. an Exempt Refinancing described in paragraphs a., b. (provided that, for purposes of this Section 33.3, paragraph b.ii. shall be deemed not to apply), d., e. or f. of the definition thereof in Part A of Annex A (*Definitions and Abbreviations*); and

C. for certainty, any incurrence of Project Debt through a drawing or disbursement:

I. that constitutes an Exempt Refinancing as described in Section 33.3.b.i.B; or

II. pursuant to the terms of any Financing Agreement referenced in paragraph a. of the definition thereof in Part A of Annex A (*Definitions and Abbreviations*) as in effect on the Financial Close Date or that was subsequently amended or entered into with the Enterprises' consent pursuant to Section 33.3.b,

ii. if, after giving effect to the implementation thereof, such amendment, waiver, exercise of any right or any Refinancing would not increase the projected (in the case of amounts that may be determined in accordance with the Financial Model) or reasonably estimated maximum amount of the Enterprises' liabilities to Developer as of the Termination Date relative to the projected or reasonably estimated, as applicable, maximum amount of such liabilities without giving effect to the implementation thereof; or

iii. if Developer has obtained the Enterprises' prior written consent to the same resulting in a potential increase in the Enterprises' liabilities to Developer of the kind referenced in Section 33.3.b.ii, which consent shall:

A. reference this Section 33.3.b.iii; and

B. be subject to the Enterprises' Acceptance, Approval, consent, approval or like assent as otherwise provided for in this Agreement with respect to the relevant amendment, waiver, exercise of any right or any Refinancing, or otherwise (if not so provided) subject to the Enterprises' Approval.

33.4. Exclusivity of Remedy

Any Termination Amount irrevocably paid by the Enterprises to Developer shall be in full and final settlement of Developer's or any Developer-Related Entity's rights and claims against the Enterprises, CDOT and the State for, or in connection with, breaches and/or termination of this Agreement whether under contract, tort, restitution or otherwise, but without prejudice to:

a. any antecedent liability of the Enterprises to Developer that arose prior to the Termination Date (but not from the termination itself) to the extent such liability has not already been taken into account in the determination of the Termination Amount (which amount, for certainty, shall in all cases be deemed to take into account any otherwise earned or payable Milestone Payment or Performance Payment that remains unpaid on the Termination Date); and

b. any liabilities arising in respect of any breach by the Enterprises after the Termination Date of any obligation under this Agreement that survives the Termination Date, to the extent such liability has not already been taken into account in the determination of any Termination Amount.

34. HANDOVER PREPARATIONS AND ACTIVITIES

34.1. Preparations for Handover

34.1.1. During:

a. the final 24 months prior to the Expiry Date; or

b. the period after the service of any Termination Notice or the occurrence of any Termination by Court Ruling,

as applicable, and in either case for a period of time thereafter as reasonably required by the Enterprises, Developer shall, without limiting its other obligations under this Agreement, use Reasonable Efforts to cooperate and coordinate with the transfer with effect from the Expiry Date or Termination Date, as applicable, of responsibility for the Work to the Enterprises and/or any Person designated by the Enterprises.

34.1.2. For purposes of Section 34.1.1, Developer's obligations to cooperate and coordinate shall include:

a. cooperating with the Enterprises and/or any Person designated by them, and providing reasonable assistance and advice concerning the Work and its transfer to the Enterprises and/or to such Person;

b. promptly providing to the Enterprises and/or their designee with:

i. Site access pursuant to Section 21.1.1; and

ii. pursuant to Section 19.1, access to and, on request pursuant to Section 19.1.3.c, copies of, all Project Records including all:

A. information on the identity, terms and conditions of employment of all employees of Developer or any Principal Subcontractor employed in the provision of the Work at such time or, with respect to any early termination of this Agreement, immediately prior to the service of any Termination Notice or the occurrence of any Termination by Court Ruling;

B. manuals;

C. equipment logs;

D. drawings;

E. files; and

F. specifications,

as reasonably required for the efficient transfer of responsibility of performance of the Project, and Developer shall warrant that, to the best of its knowledge and belief, the information contained in such Project Records is accurate in all material respects;

c. using Reasonable Efforts to complete all reasonably necessary preliminary acts (including entering into any contracts) to ensure its ability to comply with its obligations under Section 34.2.1 on and from the Expiry Date or the Termination Date, as applicable; and

d. complying with Section 12.1 where, for such purposes, an Other Department Project shall be deemed to prospectively include the Project following the future occurrence of the Expiry Date or Termination Date, as applicable.

34.1.3. In addition to Developer's obligations under Sections 34.1.1 and 34.1.2, on or before a date falling no earlier than 30 months prior to the Expiry Date, and otherwise in connection with a Termination for Convenience, the Enterprises may, in their discretion, notify Developer whether they wish to retender the provision of the Work (in whole or in part), in which case from the date of such notice, Section 12.3 shall apply where, for such purposes, an Other Department Project shall be deemed to prospectively include this Project following the future occurrence of the Expiry Date or Termination Date, as applicable.

34.2. Assignments and Transfers

34.2.1. Without limiting its other obligations under this Agreement, on the Expiry Date (or, if earlier, on the Termination Date), and subject to the Lenders Direct Agreement and the Principal Subcontractor Direct Agreements, Developer shall, unless the Enterprises elect in writing to the contrary, assign and transfer to the Enterprises, and/or any Person designated by the Enterprises, for no additional payment:

a. the benefit of any and all Principal Subcontracts, and/or other direct contractual arrangements (as may be reasonably required by the Enterprises) that Developer may have with any third parties in relation to the Project, provided that any such assignment or transfer shall be made subject to such terms and conditions as required by State Law to obtain the consent of the Colorado State Controller;

b. to the extent not effected pursuant to any assignment and transfer made pursuant to Section 34.2.1.a, all Governmental Approvals and Permits; and

c. to the extent not effected pursuant to any assignment and transfer made pursuant to Section 34.2.1.a, its rights, title and interest in and to:

i. the Transferrable Assets;

ii. warranties associated with the Transferrable Assets and any Warrantied Elements (including those referenced in Section 9.4.6); and

iii. all Project Intellectual Property (excluding any Proprietary Intellectual Property, which shall remain subject to the license granted pursuant to Section 52.1);

in the case of software (which, for certainty, shall remain subject to the license granted pursuant to Section 52.1.1.) together with (to the extent not otherwise provided for under the terms of any then existing Intellectual Property Escrow):

iv. administrator access to each proprietary system software package and workstation, so that the Enterprises can maintain the software system and create users as required for the use of each software package; and

v. an agreement for the use and maintenance of any proprietary software product that is not commercial off-the-shelf software for a period of five years from the Expiry Date (or, if earlier, the Termination Date);

provided that if, for any reason, Developer cannot assign and transfer its interest in any of the foregoing, it shall declare a trust of all its beneficial interest in the same for the benefit of the Enterprises and/or their designee, or use Reasonable Efforts to make equivalent arrangements (including with respect to Transferrable Assets not owned by Developer through a license to use the same as necessary in connection with the Project) to provide the Enterprises with equivalent rights and protections. Developer hereby irrevocably and unconditionally appoints the Enterprises as Developer's lawful attorney (and to the complete exclusion of any rights that Developer may have in such regard) for the purpose of generally executing or approving such deeds or documents and doing any such acts or things necessary to give effect to the provisions of this Section 34.2.1 as the Enterprises may in their discretion think fit.

34.2.2. Developer shall promptly after, and in any event no later than 20 Working Days after, as applicable, the Expiry Date or the Termination Date hand over to the Enterprises all Project Records and other Work Product owned by the Enterprises pursuant to Section 7.3.3.b (or complete and accurate copies to the extent originals are not required by the Enterprises) by whatever means the Enterprises reasonably require that are in the possession, custody or power of Developer or Principal Subcontractors and other Developer-Related Entities.

34.3. No Contrary Activities

Developer shall not take any action (or refrain from taking any action) in a manner that is calculated or intended to directly or indirectly prejudice or frustrate any of the activities contemplated under Section 34.1 or any transfer or assignment contemplated under Section 34.2.

PART L: LIMITATIONS ON LIABILITY

35. REMEDIES AND LIABILITY

35.1. Developer's Sole Remedies

Subject to Section 35.2, Developer's sole remedy in relation to matters for which an express right or remedy is stated in this Agreement, including as the result of the occurrence of any Supervening Event, shall be that right or remedy and Developer shall have no additional right or remedy however arising.

35.2. No Double Recovery

Notwithstanding any other provision of this Agreement, no Party shall be entitled to recover compensation under this Agreement or any other agreement in relation to the Project in respect of any Loss that it has incurred to the extent that it has already been compensated in respect of that Loss pursuant to this Agreement or otherwise.

35.3. Enterprises' Sole Remedy for Certain Developer Failures to Perform Work

Without prejudice to:

a. any other express right of the Enterprises pursuant to this Agreement (other than the right of a Principal Indemnified Party to be indemnified pursuant to Section 24.2 from and against Claims asserted against it and/or Losses suffered by it, except for its right to be indemnified in respect of Claims and/or Losses referred to in Sections 35.3.c and 35.3.d); and

b. the Enterprises' right to claim, on or after termination of this Agreement, the amount of its reasonable Losses suffered as a result of, or incurred by it as a result of rectifying or mitigating the effects of, any breach of this Agreement by Developer or the occurrence of any Developer Default, save to the extent that the same has already been recovered by the Enterprises pursuant to this Agreement or has been taken into account in the calculation of any Termination Amount,

the sole remedy of the Enterprises in respect of any Noncompliance Event, Non-Permitted Closure or any failure by Developer specified in any of Sections 1.3.1.a, 1.3.1.b, 1.3.2.a, 1.3.2.b or 1.3.2.c of Schedule 15 (*Federal and State Requirements*) shall be the operation of Schedule 6 (*Performance Mechanism*), provided that such limitation shall not apply in respect of:

c. Claims asserted against a Principal Indemnified Party by any other Person (including, for certainty, an Indemnified Party who is not a Principal Indemnified Party) and/or Losses suffered by a Principal Indemnified Party as a result of any such Claim; or

d. Losses suffered by a Principal Indemnified Party as a result of any of the events or circumstances referred to in Sections 24.2.b, 24.2.d, 24.2.e or 24.2.g (other than, in the case of any Non-Permitted Closure, loss of use of any travel lane, ramp, cross street, shoulder, sidewalk or driveway).

35.4. Non-financial Remedies

Without prejudice to the other rights and remedies under the express terms of this Agreement, nothing in Sections 35.2 and 35.3 shall prevent or restrict the right of the Enterprises or Developer to seek any non-financial remedies from the court pursuant to the Dispute Resolution Procedure.

35.5. Available Insurance

Developer shall not be entitled to any payment or credit (or any portion of either thereof) which would have been due, or from which it would have otherwise received a benefit, under this Agreement to the extent that it is (or, with respect to Section 35.5.a only, should be) able to

recover the amount or receive the benefit of such payment or credit (or such portion) under, without duplication:

a. any Insurance Policy (whether or not such insurance has in fact been effected or, if effected, has been vitiated, cancelled or declared void as a result of any act or omission of Developer (or any other Developer-Related Entity), including due to non-disclosure or under-insurance), but excluding any insurance coverage that is unavailable in respect of any Uninsurable risk or any Unavailable Term or as the result of any breach of this Agreement by the Enterprises or violation of Law by the Enterprises;

b. any other policy of insurance that Developer has taken out and maintains (excluding, for certainty, any credit enhancement policy related to the Project Debt); or

c. any other policy of insurance that Developer is entitled to claim under as an additional insured,

paragraphs a., b. and c. together, the "Available Insurance".

35.6. Waiver of Consequential Damages

a. Subject to Section 35.6.b, neither Party shall be liable to the other for any punitive, indirect, incidental or consequential damages of any nature (including, for certainty, lost toll revenue), whether arising out of a breach of this Agreement, tort (including negligence) or other legal theory of liability.

b. The limitation set out in Section 35.6.a shall not apply to:

i. any amounts expressly payable pursuant to this Agreement or any amounts entitled to be offset pursuant to Section 53.7;

ii. any Monthly Performance Deduction and/or Monthly Construction Closure Deduction the Enterprises are entitled to make pursuant to Schedule 6 (*Performance Mechanism*);

iii. Developer's liability for:

A. Claims and/or Losses (including defense costs) to the extent that they are required to have been covered by Available Insurance;

B. fines and/or penalties issued by a Governmental Authority arising out of or relating to any Developer Release of Hazardous Substances; and

C. amounts payable by Developer under an indemnity pursuant to this Agreement (but only to the extent such indemnity relates to a Claim asserted and/or Losses suffered by any Person other than a Principal Indemnified Party); and

iv. any Party's liability for Losses arising out of fraud, willful misconduct, criminal conduct, recklessness, bad faith or gross negligence on the part of the relevant Party (including, with respect to Developer, that of any other Developer-Related Entity).

PART M: CHOICE OF LAW, JURISDICTION AND DISPUTE RESOLUTION

36. CHOICE OF LAW

This Agreement shall be governed by and construed in accordance with the laws of the State of Colorado, other than any provision thereof that permits or requires the application of the laws of another jurisdiction, and regardless of any other jurisdiction's choice of law rules. Any provision incorporated herein by reference which purports to negate this or any other Special Provision, in whole or in part, shall not be valid or enforceable or available in any action at law, whether by way of complaint, defense, or otherwise. Any provision rendered null and void by the operation of this provision shall not invalidate the remainder of this Agreement, to the extent capable of execution.

37. JURISDICTION; WAIVER OF JURY TRIAL

37.1. Jurisdiction

a. Each Party agrees that it shall not be entitled to initiate any court proceedings in respect of a Dispute other than pursuant to Sections 5.q and 7 of Schedule 25 (*Dispute Resolution Procedure*), provided that it shall be so entitled:

i. with or without previously referring such Dispute to the Designated Senior Representatives pursuant to Section 2 of Schedule 25 (*Dispute Resolution Procedure*), if

A. the Dispute is with respect to the existence or legal validity of this Agreement; or

B. it makes a good faith determination that a statute of limitations would expire prior to it becoming so entitled pursuant to Sections 5.q or 7, as applicable, of Schedule 25 (*Dispute Resolution Procedure*); and

ii. after referring such Dispute to the Designated Senior Representatives pursuant to Section 2 of Schedule 25 (*Dispute Resolution Procedure*), if the Dispute is with respect to either Party's compliance with Section 5.c.i or Section 5.c.ii of Schedule 25 (*Dispute Resolution Procedure*).

b. Each of the Parties hereby irrevocably submits to the jurisdiction of the United States District Court of Colorado and the State District Court of Colorado for the City and County of Denver with regard to any Dispute and irrevocably waives, to the fullest extent permitted by applicable Law:

i. any objection it may have at any time to the laying of venue of any such action or proceeding in such court in accordance with this Section 37.1;

ii. any claim that any such action or proceeding brought in any such court has been brought in an inconvenient forum; and

iii. the right to object, with respect to any such action or proceeding, that such court does not have any jurisdiction over such Party.

37.2. Consent to Service of Process

Each Party irrevocably consents to service of process as provided for in Section 49.1.2.

37.3. Waiver of Jury Trial

EACH PARTY HEREBY WAIVES, TO THE FULLEST EXTENT PERMITTED BY APPLICABLE LAW, ANY RIGHT THAT IT MAY HAVE TO A TRIAL BY JURY IN RESPECT OF ANY PROCEEDING. Each Party hereby:

a. certifies that no Representative or agent or attorney of any such Person has represented, expressly or otherwise, that any such Person would fail to enforce or would otherwise

challenge the foregoing waiver in the event of any suit, action or proceedings relating to this Agreement; and

b. acknowledges that it has been induced to enter into this Agreement by, among other things, the mutual waivers and certifications in this Section 37.

38. DISPUTE RESOLUTION

Except as expressly set out in this Agreement and subject to Section 37, any Dispute shall be resolved in accordance with the provisions of Schedule 25 (*Dispute Resolution Procedure*).

PART N: MISCELLANEOUS

39. ASSIGNMENTS AND TRANSFERS

39.1. Assignments and Transfers by Developer

Except to the extent permitted by Sections 26.2 and 27.3 (including as a result of any foreclosure or other enforcement of any security interest that Developer is permitted to grant or create pursuant to Section 27.3), Developer shall not effect, and shall not permit, any assignment, transfer, mortgage, pledge or encumbrance of any of its interests in the Project, the Site or the Work, or its interests in, or rights or obligations under this Agreement, the Subcontracts, any Contractor Bond and the Insurance Policies, without the Enterprises' Approval.

39.2. Assignments and Transfers by the Enterprises

Each Enterprise may assign, transfer, mortgage, pledge and/or encumber its interests in, or rights or obligations under, this Agreement, any Contractor Bond, the Lenders Direct Agreement, any Principal Subcontractor Direct Agreement and/or the Insurance Policies to:

a. the other Enterprise and/or CDOT so long as:

i. such assignment, transfer, mortgage, pledge and/or encumbrance is not prohibited by Law;

ii. such assignment, transfer, mortgage, pledge and/or encumbrance does not alter in any material respect Developer's or Lenders' rights and interests with respect to the Supplemental Indenture and/or the Central 70 Note; and

iii. following such assignment, transfer, mortgage, pledge and/or encumbrance, the holder(s) of such interests, rights and obligations shall collectively have the same or equivalent:

A. legal authority with respect to the Project; and

B. legal authority and financial capacity with respect to satisfying, as applicable, its or their payment obligations with respect to the Project,

as the holder(s) thereof had immediately prior to such assignment, transfer, mortgage, pledge and/or encumbrance; and

b. any other Person:

i. with the prior written consent of Developer, which consent shall not be unreasonably withheld; or

ii. otherwise following a Change of this Agreement, but only with respect to such portion of its interest in the Project that is no longer part of the Project as a result of such Change.

40. BINDING EFFECT; SUCCESSORS AND ASSIGNS

This Agreement shall be binding upon and inure to the benefit of each Enterprise and Developer and each of their respective permitted successors and assigns.

41. SURVIVAL

The following provisions of this Agreement shall survive expiration or earlier termination of this Agreement and/or completion of the Work:

a. each Party's representations and warranties made pursuant to Section 5.1 and, pursuant to Schedule 1 (*Financial Close*), subsequently repeated;

b. all rights with respect to Contractor Bonds;

c. all Warranties with respect to the Warrantied Elements pursuant to Section 9.4;

d. the indemnifications, limitations and releases set out in Sections 24 and 35;

e. the Dispute Resolution Procedure;

f. Sections 25.5.2.b and 25.5.2.c to the extent provided for in Section 25.5.2.d;

g. the handover and handback provisions set out in Sections 13 and 34 and Schedule 12 (*Handback Requirements*);

h. all provisions related to the consequences of termination of this Agreement, including Sections 33.1.7.a, 33.3 and 33.4;

i. Section 52;

j. Section 23.6.1 of Schedule 17 (*Environmental Requirements*);

k. any provision which obligates Developer or the Enterprises to reimburse the other Party for any cost and expense incurred by them prior to the termination of the Agreement, unless already settled as part of the applicable Termination Amount or otherwise;

l. any other provisions which, either expressly or by their context, are intended to operate after termination or expiration of this Agreement and/or completion of the Work; and

m. any other provisions (including Section 15) if and to the extent necessary for the interpretation or application of the foregoing.

42. CONSTRUING THIS AGREEMENT

42.1. Entire Agreement

42.1.1. This Agreement constitutes the entire agreement among the Enterprises and Developer concerning the subject matter hereof and supersedes all prior negotiations, representations, and agreements, either oral or written, among the Parties with respect to their subject matter.

42.1.2. Each of the Parties acknowledges that, except as expressly provided in this Agreement, no Party enters into this Agreement on the basis of, and no Party relies, or has relied, upon, any statement, representation, warranty or other provision (in any case whether oral, written, express or implied) made or agreed to by any Person (whether a Party to this Agreement or not) except those made pursuant to Section 5.1 and, pursuant to Sections 2.2(b) and 2.3(a) of Schedule 1 (*Financial Close*), subsequently repeated, where the only remedy or remedies available in respect of any misrepresentation or untrue statement made to it shall be any remedy available under this Agreement), provided that this Section 42.1.2 shall not apply to any statement, representation or warranty made fraudulently, recklessly, in bad faith, as a result of gross negligence, willfully or criminally, or to any provisions of this Agreement which were induced by the same, for which the remedies available shall be all those available under the law governing this Agreement.

42.2. Interpretation

42.2.1. The language in all parts of this Agreement shall in all cases be construed simply, as a whole and pursuant to its fair meaning and not strictly for or against any Party.

42.2.2. The Parties hereto acknowledge and agree that this Agreement is the product of an extensive and thorough arm's length exchange of ideas, questions, answers information and drafts during the Proposal preparation process pursuant to the ITP.

42.2.3. Developer further acknowledges and agrees that it has independently reviewed this Agreement with legal counsel and other advisors and that Developer has, itself or through other arrangements, the requisite experience and sophistication to understand, interpret and agree to this Agreement. Accordingly, in the event of any ambiguity in, or dispute regarding the interpretation of, the provisions of this Agreement, the terms of this Agreement shall not be construed against the Persons that prepared them.

42.3. Severability

42.3.1. Notwithstanding Section 2.4.1, if any provision (or part of any provision) of this Agreement is ruled invalid (including due to Change in Law) by a court having proper jurisdiction, then the Parties shall:

a. promptly meet and negotiate a substitute for such provision or part thereof which shall, to the greatest extent legally permissible, effect the original intent of the Parties; and

b. if necessary or desirable, apply to the court which declared such invalidity for an interpretation of the invalidated provision (or part thereof) to guide the negotiations.

42.3.2. If any provision (or part of any provision) of this Agreement shall, for any reason, be held to be invalid, illegal, or unenforceable in any respect, such provision (or part thereof) shall not affect the validity, legality and enforceability of any other provision of (or the other part of such provision) or any other documents referred to in this Agreement, and this Agreement shall be construed as if such invalid, illegal, or unenforceable provision (or part thereof) had never been contained herein.

43. AMENDMENTS AND WAIVERS

43.1. Amendments

This Agreement may only be amended by a written amendment duly executed by both Parties together with, to the extent required by Law, the Colorado State Controller or its designee, unless the amendment to this Agreement is expressly allowed or required to be made in any other manner pursuant to this Agreement.

43.2. Rights and Remedies Cumulative

Except to the extent otherwise expressly provided in this Agreement, including in Sections 33.4 and 35, the rights and remedies of the Enterprises hereunder are cumulative and are not exclusive of any rights or remedies that the Enterprises would otherwise have.

43.3. Waivers

Except to the extent otherwise expressly provided in this Agreement:

a. any waiver of, or consent to depart from, the requirements of any provision of this Agreement shall be approved in the discretion of the Party giving it and shall be effective only if it is in writing by such Party, and only in the specific instance, for the specific time, subject to the specific conditions and for the specific purpose for which it has been given;

b. no failure on the part of any Party to exercise, and no delay in exercising, any right or power under this Agreement shall operate as a waiver of such right or power; and

c. no single or partial exercise of any right or power under this Agreement, including any right to give or withhold any consent, approval or Acceptance, nor any abandonment or discontinuance of steps to enforce such a right or power, shall preclude or render unnecessary any other or further exercise of such right or the exercise of any other right.

44. SET-OFF AND DEFAULT INTEREST

44.1.1. The Parties shall each have their respective set-off rights pursuant to Section 5 of Part 3 of Schedule 4 (*Payments*) with respect to their respective payment obligations under this Agreement.

44.1.2. In the event that any of the Parties fails to pay any amount under this Agreement on the due date therefor, interest shall apply and be calculated pursuant to Section 3 of Part 3 of Schedule 4 (*Payments*).

45. LIMITATION ON THIRD-PARTY BENEFICIARIES

CDOT is a third-party beneficiary of this Agreement, and each Warranty Beneficiary is a third-party beneficiary of (a) the Warranties in relation to its Warrantied Elements and (b) the obligations of Developer under Sections 9.4.1 to 9.4.5 to the extent that such obligations relate to

its Warrantied Elements. It is not otherwise intended by any of the provisions of this Agreement to create any third-party beneficiary rights hereunder, or to authorize anyone not a Party hereto to maintain a suit for personal injury or property damage pursuant to the terms or provisions hereof. Notwithstanding the foregoing, the duties, obligations and responsibilities of the Parties with respect to third parties shall remain as imposed by Law.

46. INDEPENDENT DEVELOPER

46.1. Developer as an Independent Project Contractor

Developer shall perform its duties hereunder as an independent contractor and not as an employee. Neither Developer nor any agent or employee of Developer shall be deemed to be an agent or employee of the State. Developer and its employees and agents are not entitled to unemployment insurance or workers compensation benefits through the State and the State shall not pay for or otherwise provide such coverage for Developer or any of its agents or employees. Unemployment insurance benefits will be available to Developer and its employees and agents only if such coverage is made available by Developer or a third party. Developer shall pay when due all applicable employment taxes and income taxes and local head taxes incurred pursuant to this Agreement. Developer shall not have authorization, express or implied, to bind the State to any agreement, liability or understanding, except as expressly set out herein.

46.2. No Partnership or Similar Relationship

46.2.1. Nothing in this Agreement is intended or shall be construed to create any partnership, joint venture or similar relationship between Developer and the Enterprises.

46.2.2. While the term “public-private partnership” may be used on occasion to refer to relationships of the type created pursuant to this Agreement, the Parties do not have or express any intention to form or hold themselves out as a de jure or de facto partnership, joint venture or similar relationship, to share net profits or net losses, or to give the Enterprises or Developer any rights to direct or control the activities of the other or their respective Affiliates, subcontractors or consultants, except as otherwise expressly provided in this Agreement.

46.3. No Relationship with Developer’s Employees and Subcontractors

46.3.1. Other than with respect to the Lenders Direct Agreement and the Principal Subcontractor Direct Agreements, in no event shall the relationship between the Enterprises and Developer be construed as creating any relationship whatsoever, including, for certainty, a contractual relationship, between the Enterprises and:

a. Developer’s employees;

b. any Subcontractor; or

c. any other Person.

46.3.2. Neither Developer nor any of its employees or Subcontractors is or shall be deemed to be an employee or Subcontractor of the Enterprises.

46.3.3. Except to the extent as otherwise expressly provided in this Agreement, Developer has sole authority and responsibility to employ, discharge and otherwise control its employees and Subcontractors and has complete and sole responsibility as a principal for its agents, for employees and all Subcontractors and for all other Persons that Developer or any Subcontractor hires to perform or assist in performing the Work.

47. NO PERSONAL LIABILITY

Each Enterprise’s authorized representatives, including the Enterprise Representative, are acting solely as agents and representatives of the Enterprises when carrying out the provisions of or exercising the power or authority granted to them under this Agreement, and, as such, none of them shall not be liable either personally or as employees of the Enterprises for actions in their ordinary course of employment.

48. NO FEDERAL GOVERNMENT OBLIGATIONS

Developer acknowledges and agrees that, notwithstanding any concurrence or approval by the United States Federal government in of the solicitation and award of this Agreement, the United States Federal government is not a party to this Agreement and shall not be subject to any obligations or liabilities to the Enterprises, Developer, or any other Person (whether or not a Party to this Agreement) pertaining to any matter resulting from this Agreement.

49. NOTICES

49.1. Methods of Notice Submission

49.1.1. Subject to Section 49.1.2, any notice, and any other Approval, Acceptance, consent, approval or like assent, comment, Deliverable, election, demand, direction, designation, request, agreement, instrument, certificate, report or other communication required or permitted to be given or made by a Party under this Agreement (each, a "notice" or, alternatively, a "Notice") to another Party must be given in writing through the then current Document Control System (or, as applicable, the system established pursuant to Section 1.2.7 of Schedule 15 (*Federal and State Requirements*)), and the terms "notify" and "notified" shall refer to, respectively, the acts of giving and receiving any such notice.

49.1.2. Any:

a. service of process; and

b. other notice delivered at a time when the Document Control System or, where required pursuant to Section 1.2.7 of Schedule 15 (*Federal and State Requirements*), the system referred to in such Section is unavailable,

shall be given in writing by means of physical, digital or electronic communication, but, except to the extent the Enterprises otherwise Approve excluding the use of social media, messengering, broadcast and equivalent services, to the relevant Party at the following addresses, as applicable:

Enterprises

HPTE	BE	Copy to
David I. Spector HPTE Director 4201 E. Arkansas Ave. Denver, CO 80222 (303) 757-9607 david.spector@state.co.us	Joshua Laipply, P.E. Chief Engineer 4201 E. Arkansas Ave. Denver, CO 80222 (303) 757-9204 joshua.laipply@state.co.us	Brent Butzin Assistant Attorney General Transportation Unit Ralph L. Carr Colorado Judicial Center 1300 Broadway, 10th Floor Denver, CO 80203 (720) 508-6638 Brent.Butzin@coag.gov

Developer

Christopher Hodgkins
Kiewit Meridiam Partners LLC
160 Inverness Drive West, Suite 110
Englewood, Colorado 80112
(212) 798-8686
I70E@meridiam.com

49.2. Time and Date of Notice Submission

49.2.1. A notice shall be deemed to have been delivered and received:

a. if delivered through the Document Control System (or, as applicable, the system established pursuant to Section 1.2.7 of Schedule 15 (*Federal and State Requirements*)), when recorded as submitted by such system; and

b. otherwise:

i. upon receipt (confirmed by automatic answer back, read receipt or equivalent evidence of receipt), if validly transmitted by digital or electronic distribution before 3:00 p.m. (local time at the place of receipt) on a Working Day;

ii. on the next Working Day following receipt (confirmed by automatic answer back, read receipt or equivalent evidence of receipt), if validly transmitted by digital or electronic distribution on or after 3:00 p.m. (local time at the place of receipt) on a Working Day;

iii. upon receipt, if physically delivered in person or by courier; or

iv. if delivered by courier or postage pre-paid certified or registered mail, on the date of receipt as shown by the addressee's registry or certification receipt or on the date receipt at the appropriate address is refused, as shown on the records or manifest of the United States Postal Service or independent courier.

49.3. Changes in Address

The Parties will notify each other in writing of any change of address and/or contract information, such notification to become effective five Working Days after notification.

50. FURTHER ASSURANCES

Developer shall promptly execute and deliver to the Enterprises all such instruments and other documents and assurances as are reasonably requested by the Enterprises to further evidence the obligations of Developer hereunder, including assurances regarding the obligations of Subcontractors referenced herein.

51. COSTS AND EXPENSES OF THE PARTIES

Except as otherwise expressly provided in this Agreement, each Party shall bear its own costs and expenses in connection with the preparation, negotiation, execution and performance of this Agreement and all other related agreements.

52. INTELLECTUAL PROPERTY RIGHTS

52.1. Grant of License, Ownership and Use

52.1.1. Developer hereby grants to (or, with respect to any Third Party Intellectual Property, shall provide to or obtain for) the Enterprises a non-exclusive, non-transferable (other than to CDOT), irrevocable, fully paid up and sub-licensable license to use the Project Intellectual Property and any Third Party Intellectual Property only:

a. excluding the Proprietary Intellectual Property and any Third Party Intellectual Property, for the purposes of this Project or any other bridge, highway, street and road or other transportation facility of any mode (and any project related thereto) owned and operated by the Enterprises or any other State Governmental Authority, including any Related Transportation Facility; and

b. in respect of the Proprietary Intellectual Property and, subject to Section 52.1.1.d, any Third Party Intellectual Property:

i. to the extent reasonably necessary to effect integration with any Other Department Project; and

ii. for the purposes of this Project,

provided that:

c. the granting of such license and the Enterprises' right to exercise their rights thereunder shall not be construed to provide the Enterprises with greater rights to oversee, direct, manage and engage in the Project and the Work than they would otherwise have under this Agreement, and the Enterprises agree that any use of Project Intellectual Property in violation of the same by themselves or any of their sublicenses shall be at their own risk, cost and expense; and

d. Developer may, to the extent it is reasonably unable to comply with Section 52.1.1.b with respect to any Third Party Intellectual Property, comply with its obligations under Section 52.1.1.b through functionally equivalent alternative arrangements subject to the consent of the Enterprises (such consent not to be unreasonably withheld).

52.1.2. Subject to Section 52.3 and the terms of any Intellectual Property Escrow, Developer shall deliver to the Department copies of all Project Intellectual Property used in providing the Work promptly following delivery of written request from the Enterprises. Subject to the terms of this Agreement, including Sections 7.3.3 and 34.2.1.c.iii, Project Intellectual Property shall remain exclusively the property of Developer (or, as applicable, another Person), notwithstanding any delivery of copies thereof to the Enterprises.

52.2. Right to Purchase

The Enterprises shall have the right to purchase from Developer a non-exclusive, non-transferable, irrevocable, fully paid up and sub-licensable license to use the Proprietary Intellectual Property on any other bridge, highway, street and road or other transportation facility of any mode (and any project related thereto) owned and operated by the Enterprises or CDOT subject to terms and conditions acceptable to the Enterprises and Developer (each acting reasonably). If requested by the Enterprises, Developer shall also use Reasonable Efforts to procure for the Enterprises a right to purchase an equivalent license to use any Third Party Intellectual Property.

52.3. Intellectual Property Escrow Agreement

52.3.1. Developer shall elect either to:

a. deliver and/or grant access to Project Intellectual Property comprised of software, source code and/or source code documentation directly to the Enterprises for purposes of fulfilling Developer's obligations under Section 52.1, and enabling the Enterprises to exercise their rights pursuant to the license granted to them pursuant to Section 52.1.1; or

b. Developer may elect to deposit with a neutral custodian any such Project Intellectual Property (including any modification, update, upgrade, correction, revision or replacement made to or in place of the same),

provided that Developer shall not make any such election, or seek or require terms related to any resulting Intellectual Property Escrow, in a manner that is calculated or intended to directly or indirectly prejudice or frustrate the Enterprises' ability to exercise their rights pursuant to the license granted to them pursuant to Section 52.1.1.

52.3.2. If Developer makes an election pursuant to Section 52.3.1.b, Developer shall select, subject to the Enterprises' Approval, one or more escrow companies or other neutral custodian (each an "Intellectual Property Escrow Agent"), and establish one or more escrows (each an "Intellectual Property Escrow") with the Escrow Agent, subject to terms and conditions acceptable to the Enterprises and Developer (each acting reasonably), for the deposit, retention, upkeep and release of such Project Intellectual Property. Intellectual Property Escrows also may include Developer-Related Entities other than Developer as parties.

52.3.3. If Developer elects to deliver such Project Intellectual Property to an Intellectual Property Escrow Agent, Developer shall make such delivery not later than the following times:

a. for pre-existing software, source code and source code documentation, immediately upon execution of this Agreement or, if provided by a Subcontractor, upon execution of the relevant Subcontract;

b. for software, source code and source code documentation incorporated into or used on or for the Project or any portion thereof, by the 15th Calendar Day after it is first incorporated or used; and

c. for any modification, update, upgrade, correction, revision or replacement made to or in place to or of any software, source code and source code documentation previously delivered pursuant to Section 52.3.3.a or 52.3.3.b, not later than the 15th Calendar Day after the end of the calendar quarter in which it is first incorporated or used.

52.3.4. The Enterprises shall be named intended third-party beneficiaries of each escrow agreement and each Intellectual Property Escrow with direct rights of enforcement against Developer (and, if applicable, any other Developer-Related Entity) and the relevant Intellectual Property Escrow Agent. Each escrow agreement shall provide that neither Developer nor the relevant Intellectual Property Escrow Agent (nor, if applicable, any other Developer-Related Entity) shall have any right to amend or supplement it, or waive any provision thereof, without the Enterprises' prior Approval.

52.3.5. Intellectual Property Escrows shall provide rights of access, use and inspection (but not, for certainty, possession) to the Parties and their designees at any time to permit the Enterprises fully to exercise their rights pursuant to the license granted to them pursuant to Section 52.1.1 (including, on and from the Expiry Date (or, if earlier, on and from the Termination Date) such rights as are required pursuant to Section 34.2.1.c.iv), subject to terms and conditions reasonably necessary to protect the confidentiality and proprietary nature of the contents of such Intellectual Property Escrows.

52.3.6. The Intellectual Property Escrows shall survive Substantial Completion, Final Acceptance and the end of the Term regardless of the reason for a period of five years from the Expiry Date (or, if earlier, the Termination Date), or otherwise until such earlier date such time as the Parties mutually agree, in their respective sole discretion, that the Intellectual Property contained therein is of no further use or benefit to the Project.

53. SPECIAL PROVISIONS

53.1. Controller's Approval

This Agreement shall not be valid until it has been approved by the Colorado State Controller or designee.

53.2. Governmental Immunity

No term or condition of this Agreement shall be construed or interpreted as a waiver, express or implied, of any of the immunities, rights, benefits, protections, or other provisions, of the Colorado Governmental Immunity Act, C.R.S. §§24-10-101 *et seq*., or the Federal Tort Claims Act, 28 U.S.C. §§1346(b) and 2671 *et seq*., as applicable now or hereafter amended.

53.3. Compliance with Law

Developer shall strictly comply with all applicable Federal and State laws, rules, and regulations in effect or hereafter established, including, without limitation, laws applicable to discrimination and unfair employment practices.

53.4. Binding Arbitration Prohibited

The State does not agree to binding arbitration by any extra-judicial body or person. Any provision to the contrary in this Agreement or incorporated herein by reference shall be null and void.

53.5. Software Piracy Prohibition

State or other public funds payable under this Agreement shall not be used for the acquisition, operation, or maintenance of computer software in violation of federal copyright laws or applicable licensing restrictions. Developer hereby certifies and warrants that, during the term of this Agreement and any extensions, Developer has and shall maintain in place appropriate systems and controls to prevent such improper use of public funds. If the State determines that Developer is in violation of this provision, the State may exercise any remedy available at law or in equity or under this Agreement, including, without limitation, termination of this Agreement pursuant to Section 32.2.1.a for a Developer Default number (28) in Section 32.1.1, as well as any remedy consistent with Federal copyright laws or applicable licensing restrictions.

53.6. Employee Financial Interest / Conflict of Interest

The signatories aver that to their knowledge, no employee of the State has any personal or beneficial interest whatsoever in the service or property described in this Agreement. Developer has no interest and shall not acquire any interest, direct or indirect, that would conflict in any manner or degree with the performance of Developer's services and Developer shall not employ any person having such known interests.

53.7. Vendor Offset (C.R.S. §§ 24-30-202 (1) and 24-30-202.4)

Subject to C.R.S. § 24-30-202.4 (3.5), the Colorado State Controller, or the Enterprises, may withhold payment under the State's vendor offset intercept system for debts owed to State agencies for:

a. unpaid child support debts or child support arrearages;

b. unpaid balances of tax, accrued interest, or other charges specified in C.R.S. § 39-21-101, *et seq*.;

c. unpaid loans due to the Student Loan Division of the Department of Higher Education;

d. amounts required to be paid to the Unemployment Compensation Fund pursuant to Articles 70-82 of Title 8, C.R.S.; and

e. other unpaid debts owing to the State as a result of final agency determination or judicial action.

53.8. Public Contracts for Services

Developer certifies, warrants, and agrees that it does not knowingly employ or contract with an illegal alien who will perform work under this Agreement and will confirm the employment eligibility of all employees who are newly hired for employment in the United States to perform work under this Agreement, through participation in the E-Verify Program or the CDOT program established pursuant to C.R.S. § 8-17.5-102(5)(c), Developer shall not knowingly employ or contract with an illegal alien to perform work under this Agreement or enter into a contract with a Subcontractor that fails to certify to Developer that the Subcontractor shall not knowingly employ or contract with an illegal alien to perform work under this Agreement. Developer:

a. shall not use E-Verify Program or CDOT program procedures to undertake pre-employment screening of job applicants while this Agreement is being performed;

b. shall notify the Subcontractor and the contracting State agency within three Calendar Days if Developer has actual knowledge that a Subcontractor is employing or contracting with an illegal alien for work under this Agreement;

c. shall terminate the subcontract if a Subcontractor does not stop employing or contracting with the illegal alien within three Calendar Days of receiving the notice; and

d. shall comply with reasonable requests made in the course of an investigation, undertaken pursuant to C.R.S. § 8-17.5-102(5), by the Colorado Department of Labor and Employment.

If Developer participates in the CDOT program, Developer shall deliver to the contracting State agency, institution of higher education or political subdivision a written, notarized affirmation, affirming that Developer has examined the legal work status of such employee, and shall comply with all of the other requirements of the CDOT program. If Developer fails to comply with any requirement of this provision or C.R.S. § 8-17.5-101, *et seq.*, the contracting State agency may terminate this Agreement for breach and, if so terminated, Developer shall be liable for damages.

54. COUNTERPARTS

This Agreement (and an amendment or waiver in respect to this Agreement) may be executed in one or more counterparts. Any single counterpart or a set of counterparts executed, in either case, by each of the Parties and, to the extent required by Law, the Colorado State Controller or its delegate, shall constitute a full and original instrument for all purposes.

[*remainder of page left intentionally blank; signature page follows*]

IN WITNESS WHEREOF, the Parties hereto have executed this Agreement as of the date it is approved and signed by the Colorado State Controller or their designee below.

KIEWIT MERIDIAM PARTNERS LLC

By: _____
John Dionisio
Authorized Person

COLORADO HIGH PERFORMANCE TRANSPORTATION ENTERPRISE

By: _____
David I. Spector
Director

COLORADO BRIDGE ENTERPRISE

By: _____
Joshua Laipply, P.E
Chief Engineer

APPROVED:
Cynthia H. Coffman, Attorney General

By: _____
Brent E. Butzin
Assistant Attorney General

ALL AGREEMENTS REQUIRE APPROVAL BY THE STATE CONTROLLER

C.R.S. § 24-30-202 requires the State Controller to approve all State Agreements. This Agreement is not valid until signed and dated below by the State Controller or its delegate. Developer is not authorized to begin performance until such time. If Developer begins performing prior thereto, the State of Colorado is not obligated to pay Developer for such performance and/or for any goods and/or services provided hereunder.

STATE CONTROLLER
Robert Jaros, CPA, MBA, JD

By: _____

Date: 11/21/17

ANNEX A: DEFINITIONS AND ABBREVIATIONS

Part A: Definitions

Except as otherwise specified herein, or as the context may otherwise require, the following terms have the respective meanings set out below for all purposes of this Agreement:

"Abandonment" means either:

a. Developer demonstrates through statements, acts or omissions an intent not to perform, or continue to perform, a material part of the Work; or

b. the failure to perform a material part of the Work for a continuous period of 45 Calendar Days (except to the extent that such failure is substantially consistent with the then current Project Schedule and does not otherwise constitute a breach of this Agreement),

in each case unless such intention or failure is otherwise expressly permitted or excused pursuant to this Agreement, including as a result of the occurrence of any Compensation Event or Relief Event.

"Acceptance" has the meaning given to it in Section 2.2.3.a and "Accept", "Acceptable" and "Accepted" shall be similarly construed.

"Accepted Independent Consultant" has the meaning given to it in Section 3.4.b.i of Schedule 12 (*Handback Requirements*).

"Access Permit" means any Special Permit and any Utility Permit.

"Account Balances" means, in respect of each bank account and/or trust account held by or on behalf of Developer (for certainty, excluding the Handback Reserve Account and the Physical Damage Proceeds Reserve):

a. the balance of such account; *plus*

b. to the extent a letter of credit has been issued in partial or full substitution for any amount otherwise required to stand to the credit of any such account pursuant to the Financing Documents, the undrawn principal amount of such letter of credit,

in each case as of the Termination Date.

"Active Traffic Management" means real-time management of traffic using ITS and/or Variable Message Signs.

"Activity" means each task or sub-task that is identified by Developer as being necessary to complete the Construction Work and the O&M Work During Construction, and that is included in the Project Schedule as a subcomponent of the Work Breakdown Structure.

"Actual Benchmarked Insurance Cost" means, in respect of any Insurance Review Period, the aggregate of the insurance premiums reasonably incurred by Developer to maintain the Benchmarked Insurances during such period, excluding any broker's fees and expenses.

"Ad Valorem and Possessory Interest Tax" has the meaning given to it in Section 30.1.3.a.

"Additional Right-of-Way" means all Additional ROW Parcels held or acquired in the name of CDOT (or in such other name(s) as the Enterprises may otherwise determine in

their discretion) pursuant to Section 7.3.1, but in each case with effect only from the Project License Start Date and only until the Project License End Date, in each case, for the relevant Additional ROW Parcel.

"Additional ROW Parcels" means each parcel of land that Developer proposes, at its discretion, to form part of the Additional Right-of-Way, and that subsequently becomes part of the Additional Right-of-Way, pursuant to Schedule 18 (*Right-of-Way*).

"Additional Survey Data" means any survey data other than the Supplied Survey Data.

"Additional Warranties" means those warranties that Developer is required to provide pursuant to Schedule 10 (*Design and Construction Requirements*).

"ADR" shall have the meaning given to it in Section 2(b) of Part A of Schedule 16 (*Mandatory Terms*).

"Affected Party" has the meaning given to it in the definition of Force Majeure Event in this Part A of Annex A (*Definitions and Abbreviations*).

"Affiliate" means, in relation to any Person:

a. any other Person having Control of that Person;

b. any other Person over whom that Person has Control; and

c. any Person over whom any other Person referred to in paragraph a. of this definition also has Control.

"Age" means the elapsed time since an Element was first constructed or installed or if applicable, last reconstructed, rehabilitated, restored, renewed or replaced.

"Agreed or Determined" has the meaning given to it in Section 2.2.1.

"Agreement" has the meaning given to it in the Preamble and, for certainty, includes this Annex A (*Definitions and Abbreviations*) and the Schedules.

"Agreement Date" has the meaning given to it in the Preamble.

"Annual O&M Report" has the meaning given to it in Section 13.2 of Schedule 11 (*Operations and Maintenance Requirements*).

"Appendix B Parcel" means any ROW Parcel listed in Appendix B (*Known Hazardous Substances Parcels*) of Schedule 17 (*Environmental Requirements*).

"Appendix B Parcel Costs" means the aggregate amount of Excess Costs, Milestone Payment Delay Costs and/or Delay Financing Costs resulting from the occurrence of all Appendix B Parcel Unexpected Hazardous Substances Events (for certainty, whether or not such events are also Compensation Events), excluding any such event:

a. that resulted in aggregate Excess Costs, Milestone Payment Delay Costs and Delay Financing Costs equal to or less than ; and

b. to the extent that it arose as a result of any breach of Law, Governmental Approval, Permit or this Agreement, fraud, willful misconduct, criminal conduct, recklessness, bad faith or negligence by or of any Developer-Related Entity.

"Appendix B Parcel Relief Start Date" means the Calendar Day on which the aggregate amount of Appendix B Parcel Costs first equals or exceeds

"Appendix B Parcel Unexpected Hazardous Substances Event"	the encountering or discovery of collectively all Unexpected Hazardous Substances on, in or under an individual Appendix B Parcel.
"Applicable Tax"	means any income tax that is imposed on Developer (or, to the extent that Developer is treated as a pass through entity for Applicable Tax purposes, on its Equity Members) by and payable to the United States, any state of the United States or any political subdivision of any state of the United States, excluding, however, any income tax that is payable to any thereof solely due to Developer or any of the Equity Members being incorporated, formed or domiciled outside of any state of the United States.
"Approval"	has the meaning given to it in Section 2.2.3.b and "Approve" and "Approved" shall be similarly construed.
"As-Built"	means the revised set of drawings, specifications, documents, data and surveys submitted by Developer and Accepted by the Department pursuant to Schedules 8 (*Project Administration*) and 10 (*Design and Construction Requirements*) and showing the exact dimensions, geometry, and location of completed Construction Work.
"Asset"	means any physical asset used from time to time by Developer or a Subcontractor to perform its obligations under this Agreement or any Subcontract, including any: a. Element; b. land or buildings (whether or not part of or on the Site); c. plant or machinery; d. equipment; e. spare parts; and f. tools.
"Asset Condition Inspections"	means those inspections required to be conducted pursuant to Section 8 of Schedule 11 (*Operations and Maintenance Requirements*) to determine the condition of all Elements and to identify structural and non-structural deficiencies which may present a potential safety hazard.
"Asset Condition Report"	means a report prepared by Developer pursuant to Section 3.5 of Schedule 12 (*Handback Requirements*).
"Authority Having Jurisdiction"	means the Denver Fire Department.
"Automated Vehicle Locator (AVL) System"	means the system described in Section 12 of Schedule 11 (*Operations and Maintenance Requirements*).
"Automatic License Plate Recognition"	means a camera-based system used to obtain an image of a vehicle's license plate if a transponder is not detected.
"Automatic Traffic Recorder"	means a system that continuously collects vehicle volume and functional classification data using in-pavement loops and piezoelectric sensors.
"Automatic Vehicle Identification Reader"	means the system that is installed at each tolling point and used to read tag information stored inside each transponder.
"Available Insurance"	has the meaning given to it in Section 35.5.
"Average Daily Traffic"	means the average total traffic, in both directions, in one Calendar Day.

"Bare and Wet Pavement" means when a minimum of 95% of the driving surface (edge line to edge line) including shoulders is free of snow, slush and/or ice.

"Base Benchmarked Insurance Cost" means, in respect of any Insurance Review Period:

a. the greater of:

i. the Proposal Insurance Cost; and

ii. either:

A. in respect of the first Insurance Review Period, the Actual Benchmarked Insurance Costs for such period; or

B. in respect of any other Insurance Review Period, the amount calculated pursuant to paragraph a.ii.A of this definition, indexed annually in respect of each subsequent Insurance Review Period from each Insurance Renewal Date in respect of which such costs were originally paid to the corresponding Insurance Renewal Date in such subsequent Insurance Review Period,

less

b. any Base Benchmarked Insurance Deduction in respect of such Insurance Review Period.

"Base Benchmarked Insurance Deduction" means, in respect of any Uninsurable risk or any Unavailable Term that relates to any Benchmarked Insurance, an amount calculated in respect of an Insurance Review Period that equals:

a. the amount (if any) by which the Base Benchmarked Insurance Cost would have been a lesser amount had:

i. such risk been an Uninsurable risk; or

ii. such Insurance Term been an Unavailable Term,

in the case of either i. or ii., as of the dates by reference to which the Base Benchmarked Insurance Cost in respect of such Insurance Review Period is calculated; or

b. if, in the reasonable opinion of the Insurance Broker that prepares the applicable Joint Insurance Cost Report, it is impossible to determine an amount pursuant to paragraph a. of this definition in respect of any such Uninsurable risk or Unavailable Term, the amount (if any) by which it is reasonable to reduce the Base Benchmarked Insurance Cost under such circumstances, having due regard (to the extent possible) to:

i. the amount by which the Actual Benchmarked Insurance Cost is less than it would have been as a result of such risk becoming an Uninsurable risk or of such Insurance Term becoming an Unavailable Term; and

ii. the amount determined pursuant to paragraph b.i. of this definition as a percentage of the Actual Benchmarked Insurance Cost as calculated

immediately prior to such risk becoming an Uninsurable risk or such Insurance Term becoming an Unavailable Term.

"Base Case Equity IRR" means the Preliminary Equity IRR as updated pursuant to Schedule 1 (*Financial Close*).

"Base CPP" means the "Base Capital Performance Payment" set out in Section 2(f) of Part 2 of Schedule 6 (*Performance Mechanism*).

"Base Financial Model" means the financial model generated and computed by spreadsheet software as submitted in the Developer's Proposal (and subsequently replaced in this Agreement, pursuant to the Project Agreement Amendment, by the Financial Model Accepted by the Enterprises pursuant to Section 2.2(h)(i) of Schedule 1 (*Financial Close*)), a copy of which is attached as Schedule 26 (*Base Financial Model*).

"Base MPP" means the Base CPP plus the Base OMRP.

"Base OMRP" means the "Base OMR Payment" set out in Section 2(f) of Part 2 of Schedule 6 (*Performance Mechanism*).

"Baseline Asset Condition Inspection Plan" has the meaning given to it in Section 2.3.2 of Schedule 11 (*Operations and Maintenance Requirements*).

"Baseline Credit Spreads" means:

a. subject to paragraph b. of this definition, the credit spreads in the "Proposer Basis Scale" submitted by the Preferred Proposer pursuant to Section 6.6 of the Financial Proposal Submission Requirements as defined in the ITP; or

b. for purposes of Section 5 of Annex A to Schedule 1 (*Financial Close*), and where expressly stated that such term shall have the meaning given to it in this paragraph b., the relevant baseline credit spreads issued by the Enterprises to the Proposers pursuant to Section 4.2.3.c.ii of Part C of the ITP.

"Baseline Inspections" has the meaning given to it in Section 2.3.1.a of Schedule 11 (*Operations and Maintenance Requirements*).

"Baseline Schedule " means the logic-based Critical Path schedule for all Construction Work and all O&M Work During Construction which has been prepared by Developer based on the Proposal Schedule and Approved by the Enterprises pursuant to Section 3.3.4.a. of Schedule 8 (*Project Administration*).

"Baseline Substantial Completion Date" means the Baseline Substantial Completion Target Date, as such date may be extended from time to time pursuant to:

a. Section 15.3.1.c.iii, as a result of the occurrence of a Supervening Event; or

b. a Change documented in a Change Order.

"Baseline Substantial Completion Target Date" means March 4, 2022, as such date shall be modified on a day for day basis to reflect any delay in achieving Financial Close relative to November 30, 2017 (the date assumed in the ITP), as such modification shall be formalized pursuant to the Project Agreement Amendment in accordance with paragraph d. of the definition thereof in this Part A of Annex A (*Definitions and Abbreviations*).

"Baseline TIFIA Term Sheet"	means the Baseline TIFIA Term Sheet attached as Exhibit 1 in Part I to the ITP as of the Final Project Information Date.
"BE"	has the meaning given to it in the Preamble.
"BE Trustee"	means Zions Bank, a division of ZB, National Association, the successor trustee under the Master Indenture.
"Benchmark Interest Rates"	means the publicly documented interest rates of each maturity included in the following indices: a. the LIBOR swap spot curve, as provided by Bloomberg; b. the Overnight Index Swap curve, as provided by Bloomberg; c. the Interpolated Curve (ICURV), as provided by Bloomberg. d. the U.S. Spot Treasury Yield Curve; e. the Municipal Market Data (MMD) Benchmark, as provided by Thomson Reuters; f. the Securities Industry and Financial Markets Association (SIFMA) Municipal Swap Index (formerly known as the Bond Market Association (BMA) Municipal Swap Index); and g. the State and Local Government Series (SLGS) index, as provided by the US Treasury.
"Benchmarked Insurance Inception Date"	means the Substantial Completion Date.
"Benchmarked Insurance"	means each of the Insurance Policies required pursuant to Section 2 of Schedule 13 (*Required Insurances*).
"Beneficial Reuse and Materials Management Plan"	means the "Beneficial Reuse and Materials Management Plan" in the form provided in the Reference Documents.
"Best Management Practices"	has the meaning established by applicable Environmental Law governing the particular environmental media or source of Hazardous Substances such practices are intended to address or, in the absence of a particular definition under Environmental Law, shall refer to best practices commonly used to avoid a Release or exacerbation of a Release with respect to the relevant environmental media or source of Hazardous Substances.
"BNSF"	means BNSF Railway Company.
"BNSF Crossing"	means the existing and/or proposed crossing by the BNSF Railroad through the I-70 East corridor on the Right-of-Way as described in Section 10.1.5 of Schedule 10 (*Design and Construction Requirements*).
"BNSF RRA"	means the railroad agreement between CDOT and BNSF in relation to the Project, a draft of which agreement was provided to the Preferred Proposer as one of the Reference Documents numbered 29.10.10.03.
"BNSF Work"	means all duties and services to be furnished and provided by BNSF as required by the BNSF RRA.
"Bond Financing"	means any Project Debt financing to be provided through the capital markets issuance (including through a private placement) of either: a. PABs by the PABs Issuer; or

b. taxable bonds,

that, in the case of paragraphs a. or b., is assumed in the Base Financial Model.

"Breakage Costs" means any prepayment premiums or penalties, make-whole payments or other prepayment amounts, including costs of early termination of interest rate and inflation rate hedging, swap, collar or cap arrangements, that Developer must pay, or that may be payable or credited to Developer, under any Financing Document or otherwise as a result of the payment, redemption, acceleration or reduction of all or any portion of the principal amount of Project Debt prior to its scheduled payment date, excluding, however, any such amounts included in the principal amount of any Refinancing.

"Bridge Surcharges" means the bridge safety surcharges imposed by BE pursuant to C.R.S. § 43-4-805.

"Build America Bureau" means the Build America Bureau within the US DOT.

"Calendar Day" means a calendar day as determined by reference to the time and date in Denver, Colorado, and "day" means any such calendar day.

"Calendar Year" means each consecutive period of 12 months commencing on January 1 and ending on December 31 as each such day shall be determined by reference to the time and date in Denver, Colorado.

"Category 1 Defect" means an O&M Defect in an Element or any part of an Element which causes or has the potential to cause any one or more of the following:

a. an immediate or imminent health or safety hazard, nuisance or other similar immediate or imminent risk to Users or workers (including for example inconveniences such as delays and detours, rough rides, obstacles, slippery conditions, or issues requiring Users to make sudden evasive maneuvers);

b. an immediate or imminent risk of structural failure;

c. an immediate or imminent risk of damage to a third party's property or equipment; and

d. an immediate or imminent risk of damage to the Environment or any Improvements.

"Category 2 Defect" means an O&M Defect in an Element or any part of an Element other than a Category 1 Defect.

"CCD Identified Future Improvements" means all projects listed in Sections 1.17.1 and 1.17.3 of Section 1 of Schedule 10 (*Design and Construction Requirements*).

"CDOT" has the meaning given to it in the Preamble and, for certainty, refers to the Colorado Department of Transportation acting in its own capacity and not pursuant to a delegation of authority by the Enterprises pursuant to Section 18.1.2.

"CDOT Roadways" means I-270, I-225, Vasquez Boulevard, Colorado Boulevard and Quebec Street, in each case including the ramps up to the intersecting cross-roadway (including directional island and free-flow turn lane where present).

"CDOT Standard Specifications" has the meaning given to it in Section 1.1 of Appendix A to Schedule 10A (*Applicable Standards and Specifications*).

"Central 70 Note" has the meaning given to it in the Supplemental Indenture.

"Chairperson" has the meaning given to it in Section 5.c.iii of Schedule 25 (*Dispute Resolution Procedure*).

"Change" means any change in the Work relative to what is otherwise permitted or required under this Agreement, including any change or addition to, or replacement of, a Project Standard.

"Change in Costs" means:

a. except to the extent paragraphs b. or c. of this definition apply, in respect of:

i. any Compensation Event (but, in the case of a Compensation Event falling within paragraph c.ii of the definition thereof in this Part A of Annex A (*Definitions and Abbreviations*), subject to the proviso to the definition of Qualifying Change in Law in this Part A of Annex A (*Definitions and Abbreviations*)); or

ii. any Developer Change documented in a Change Order, but only for purposes of estimating costs pursuant to Sections 2.1 (subject to the proviso to such Section) and 2.2.c of Schedule 24 (*Change Procedure*) and of calculating net savings pursuant to Section 3 of Schedule 24 (*Change Procedure*)),

the effect of such Compensation Event or Developer Change (whether such effect is (I) of a one-off or recurring nature and/or (II) positive or negative) on the actual or anticipated losses, charges, liabilities and costs and expenses of Developer, including, as relevant and without double counting:

iii. any reasonable external professional costs and expenses incurred:

A. in complying with Developer's obligations under Section 15.2.2;

B. in respect of any such Compensation Event (other than any such event as described in paragraphs d. and e., of the definition thereof in this Part A of Annex A (*Definitions and Abbreviations*)), in preparing any related Supervening Event Submission (or any update thereof) in compliance with Section 15.1; and

C. in respect of any Compensation Event as described in paragraphs d. or e. of the definition thereof in this Part A of Annex A (*Definitions and Abbreviations*), in complying with Sections 1.1.c and 1.2 of Schedule 24 (*Change Procedure*);

iv. any expenditure that is treated as a capital expenditure in accordance with GAAP;

v. any life-cycle, operating, maintenance or

replacement costs;

vi. any employment and labor costs;

vii. with respect to any insurance that Developer is required to obtain and maintain, or cause to be obtained and maintained, pursuant to Sections 25.1.1 and 25.1.2.c, any change in premiums, premium tax or broker's fees and expenses, including any change therein resulting from:

A. a change in the amount of any deductible or in any amount of coverage; and

B. any other change in such insurance, including to Insurance Terms; and

viii. any financing costs (excluding any Delay Financing Costs and any Milestone Payment Delay Costs) incurred by Developer as a result of the occurrence of such Compensation Event, including:

A. any reasonable external professional costs and expenses incurred in complying with Developer's obligations under Sections 15.5.1 and 28.4.1;

B. any such costs required to ensure Developer's continued compliance with the Financing Agreements;

C. any reasonable commitment fees, interest costs and hedging costs, including Breakage Costs;

D. any lost interest on any of Developer's own capital; and

E. any other such costs for debt or equity finance required pending receipt of a payment from the Enterprises in connection with such Compensation Event; and

in all cases for purposes of this paragraph a. of this definition:

ix. other than with respect to paragraphs a.iii., a.vii. or a.viii. of this definition, as any amounts falling within this definition of Change in Costs are calculated or otherwise taken into account (including through mark-ups) in accordance with Appendix A to Schedule 24 (*Change Procedure*); and

x. excluding:

A. any internal costs, fees or expenses of any Developer-Related Entity except to the extent expressly permitted in accordance with Appendix A to Schedule 24 (*Change Procedure*); and

B. any costs or expenses that are expressly

provided to be incidental and excluded pursuant to the terms of Schedule 17 (*Environmental Requirements*);

b. subject to Sections 15.7.1.d.ii and 33.1.6.c.i, in respect of any:

i. Non-Appendix B Parcel Unexpected Hazardous Substances Event; or

ii. Appendix B Parcel Unexpected Hazardous Substances Event,

Excess Costs; and

c. subject to Section 33.1.6.c.i, in respect of any Unexpected Groundwater Contamination Event, Excess Groundwater Costs.

"Change in Law" means the coming into effect after the Setting Date of:

a. the enactment, promulgation or adoption of any Law;

b. a binding change in the judicial or administrative interpretation of any Law; or

c. any modification (including repeal) of any Law,

in each case, by a Governmental Authority that:

d. is materially different from or inconsistent with Law as in effect prior to the coming into effect of the relevant change as referenced in paragraphs a., b. or c. of this definition; and

e. was not (in the same or substantially similar form and substance to that which later comes into effect) pending, passed or adopted, including in the form of a bill or draft, as of the Setting Date,

provided that Change in Law shall exclude any such enactment, promulgation, adoption, change or modification of any (i) Federal Law (other than any Public Safety Order), (ii) State or local labor Law or (iii) State or local tax Law in each of cases (i), (ii) or (iii) of general applicability.

"Change of Control" means any direct or indirect Equity Transfer of interests in either Developer or any Equity Member that results in or could (upon the occurrence of any condition or exercise of any right or option) result in any change in the Person or Persons that has direct or indirect Control of Developer or such Equity Member, excluding:

a. any Permitted Equity Transfer; and

b. a bona fide open market transaction in securities effected on a recognized public stock exchange involving an initial public offering.

"Change Order" has the meaning given to it in Section 1.2.e of Schedule 24 (*Change Procedure*).

"Circuit Time for Plowing" means the total time required to fully service a designated Snow Route calculated from the time the plow vehicle leaves the yard to the time it has completed the plowing operation on the entire plow route.

"Circuit Time for Spreading" means the total time required to fully service a designated salt or liquid anti-icing/de-icing Snow Route calculated from the time the Spreader vehicle leaves the yard to the time it completes the route.

"City of Denver" means the City and County of Denver, Colorado.

"Civil Rights Requirements" has the meaning given to it in Section 1.1.1 of Schedule 15 (*Federal and State Requirements*).

"Claim" means any claim, demand, action, cause of action, proceeding (legal or administrative), investigation, judgment, demand, suit, dispute or liability.

"Closed Circuit Television" means cameras used for monitoring travel conditions.

"Closure" means that all or part of any travel lane, ramp, cross street, shoulder, sidewalk or driveway within the O&M Limits is closed or blocked, or that the use thereof is otherwise restricted, for a period of any duration.

"Closure Deduction Period" means, in respect of any Non-Permitted Closure, each continuous period of 15 minutes commencing from and including:

a. subject to paragraph b. of this definition, the commencement time of such Non-Permitted Closure; or

b. in the case of any Closure that is deemed to be a Non-Permitted Closure pursuant to Section 2.11.14.c or 2.11.14.d of Schedule 10 (*Design and Construction Requirements*), the expiry of the 30 minute period referred to in the relevant Section,

provided that, for certainty, the Closure Deduction Period during which the relevant Closure actually ends (or is deemed to end in accordance with the proviso to the definition of Non-Permitted Construction Closure in this Part A of Annex A (*Definitions and Abbreviations*)) will have a duration of less than 15 minutes and any reference in Schedule 6 (*Performance Mechanism*) to a "partial" Closure Deduction Period shall be deemed to refer to such Closure Deduction Period in respect of the relevant Non-Permitted Closure.

"Closure Default Event" means the occurrence of any of the following:

a. during the Construction Period, the cumulative amount of Construction Closure Deductions accrued during:

i. any rolling 4 month period equals or exceeds ; or

ii. any rolling 12 month period equals or exceeds ;

b. during the Operating Period, the cumulative amount of Operating Period Closure Deductions accrued during:

i. any 1 month period equals or exceeds (indexed); or

ii. any rolling 4 month period equals or exceeds (indexed); or

iii. any rolling 12 month period equals or exceeds (indexed),

provided that, for certainty, any Construction Closure Deduction or

Operating Period Closure Deduction that is being disputed in good faith by Developer shall be disregarded for purposes of determining whether a Closure Default Event has occurred until such time as it has been Agreed or Determined that the relevant deduction was valid.

"Collateral Agent" means any financial institution designated by the Lenders to act as their trustee or agent pursuant to the Financing Documents.

"Command Control and Monitoring System" means the integrated overarching system required to monitor, control and implement the various fire, life safety, and other systems located in the Cover.

"Commercial Panel" means the dispute resolution panel of such name to be established pursuant to Section 5 of Schedule 25 (*Dispute Resolution Procedure*).

"Committed Investment" means:

a. any form of direct investment by Equity Members in Developer, including the purchase of equity shares in Developer;

b. any Equity Member Debt; or

c. any irrevocable on-demand letter of credit issued by an Eligible Financial Institution for the account of an Equity Member naming Developer and/or Collateral Agent as beneficiary and securing the provision of any direct investment or debt referenced in paragraph a. of this definition.

"Compensable Construction Period Event" has the meaning given to it in Section 15.7.1.

"Compensable Costs" means:

a. with respect to a Compensation Event only, any Change in Costs; and;

b. with respect to any Relevant Event:

i. if Section 15.3.1.c.iii.A or 15.3.1.c.iii.B applies, any Delay Financing Costs; and

ii. if Section 15.3.1.c.ii applies, any Milestone Payment Delay Costs,

in each case for which the Enterprises are otherwise obligated to compensate Developer in respect of such event as determined pursuant to Section 15.3 (for certainty, net of any amount that Developer is (or, pursuant to Section 35.5.a, should be) entitled to recover under any Available Insurance).

"Compensation Event" means:

a. any:

i. breach of this Agreement by the Enterprises; or

ii. violation of Law by the Enterprises,

except to the extent such breach or violation is a Compensation Event under any other paragraph of this

definition;

b. any:

i. failure by the Enterprises to provide Developer with Possession of any ROW Parcel by:

A. other than with respect to the Existing CDOT Right-of-Way, the applicable date specified in the "Date First Available for Possession" column in the table in Appendix A to Schedule 18 (*Right-of-Way*);

B. with respect to the Existing CDOT Right-of-Way, issuance of NTP2; and

C. with respect to the Maintenance Yard, the Snow and Ice Control Commencement Date;

ii. failure by the Enterprises to continuously provide Developer with Possession of any ROW Parcel or any Additional ROW Parcel from the applicable Project License Start Date to the applicable Project License End Date;

iii. failure by the Enterprises to comply with their obligation to complete Property Management of certain ROW Parcels pursuant to Sections 2.2.2 and 2.2.3 of Schedule 18 (*Right-of-Way*); or

iv. provision by the Enterprises to Developer of Possession of any ROW Parcel subject to the rights of other Persons, restrictions or qualifications that were not identified, disclosed, expressly anticipated or in existence on or prior to the Setting Date as determined by reference to:

A. the terms of this Agreement and each Third Party Agreement;

B. Law;

C. any title commitment in relation to this Project in the possession of or made available to the Preferred Proposer and/or the Developer-Related Entities;

D. the Reference Documents;

E. Beneficial Reuse and Materials Management Plan; and

F. Public ROW Records;

c. any:

i. Discriminatory Change in Law; or

ii. Qualifying Change in Law,

(excluding any resulting Enterprise Change made pursuant to Section 8.6.2);

d. delivery of a Directive Letter pursuant to Section 1.4.a of

Schedule 24 (*Change Procedure*);

e. an Enterprise Change documented in a Change Order;

f. any of the following:

i. any Non-Appendix B Parcel Unexpected Hazardous Substances Event;

ii. any Appendix B Parcel Unexpected Hazardous Substances Event that:

A. occurs during the Construction Period and:

I. prior to the Appendix B Parcel Relief Start Date, but only with respect to, and to the extent of, the effects of such event on the Construction Work that are continuing on or after the Appendix B Parcel Relief Start Date; or

II. on or after the Appendix B Parcel Relief Start Date; or

B. occurs during the Operating Period;

iii. any Unexpected Groundwater Contamination Event;

iv. any Unexpected Utility Condition Event;

v. the encountering or discovery of any:

A. Unexpected Geological Conditions;

B. Unexpected Historically Significant Remains; or

C. Unexpected Endangered Species; or

vi. any Unexcused Utility Owner Delay; or

g. any incident of physical damage to an Element of the Project or delay of or disruption to the Work caused by:

i. installation, testing or maintenance of any ETC or ITS Elements by the ETC System Integrator pursuant to the E-470 TSA or the E-470 Installation Agreement;

ii. the construction, operation or maintenance of any Other Department Project, or any other facility, infrastructure or project constructed, operated and/or maintained by or on behalf of either Enterprise and/or CDOT, within or in the vicinity of the Right-of-Way, but only to the extent not constructed, operated or maintained by Developer (or another Person under common Control with Developer) pursuant to this Agreement or otherwise; or

iii. the installation by the Enterprises of any advertising on the Right-of-Way or any Additional Right-of-Way;

h. any breach by the City of Denver of the Denver IGA that

results in:

i. the assessment of fees or expenses on Developer (or any Subcontractor) that are waived or suspended by the City of Denver under Section 4.A.(i)-(iii) and Exhibit B of the Denver IGA; or

ii. the City of Denver not accepting the quantum of fill dirt specified in Section 4.D of the Denver IGA, provided that such fill dirt satisfies the requirements specified in the Denver IGA and Reference Document 29.17.11;

i. any:

i. Enterprise Release of Hazardous Substances;

ii. Loss by Developer as a result of it being held liable as generator under 40 CFR Part 262 or arranger under CERCLA Section 107(a) with respect to any Hazardous Substances for which the Developer is not identified as the generator and arranger pursuant to Section 23.6.1.a of Schedule 17 (*Environmental Requirements*) notwithstanding the Parties' agreement pursuant to Section 23.6.1.b of Schedule 17 (*Environmental Requirements*); or

iii. Third Party Release of Hazardous Substances that occurs during the Operating Period;

j. any physically intrusive inspection conducted pursuant to Section 21.2.1 to the extent such inspection constitutes a Compensation Event pursuant to Section 21.2.2.b;

k. the issuance of any Safety Compliance Order, excluding any such order or part thereof that orders or directs Safety Compliance that Developer is otherwise obligated to implement pursuant to this Agreement;

l. any suspension by the Enterprises pursuant to Section 23.3.1 to the extent such suspension constitutes a Compensation Event pursuant to Section 23.3.2;

m. any Required Action by the Enterprises that is not taken in response to or because of Developer's breach of its obligations under this Agreement or any Developer Default;

n. Developer's obligation to comply with Section 12.2.b with respect to any Related Transportation Facility that:

i. existed on the Setting Date to the extent the relevant configuration, design and use of such facility was not Known or Knowable on such date; or

ii. did not exist on the Setting Date and:

A. is not a CCD Identified Future Improvement; or

B. is a CCD Identified Future Improvement, but only to the extent the configuration, design and/or use of such improvement

was not Known or Knowable on such date,

in the case of either i. or ii., to the extent such obligation requires any expenditure that would be treated as a capital expenditure in accordance with GAAP;

o. any:

i. execution of:

A. [*Reserved.*];

B. an RRA on terms not materially consistent with the terms set out in the most recent draft of such agreement provided to the Preferred Proposer as one of the Reference Documents numbered 29.10.10.03 on or prior to the Final Project Information Date; or

C. the Cover Maintenance Agreement on terms not materially consistent with the terms set out in the most recent draft of such agreement provided to the Preferred Proposer as Reference Document numbered 29.10.14.10 on or prior to the Final Project Information Date;

ii. designation by the Enterprises of a new Third Party Agreement pursuant to Section 8.5.2;

iii. material amendment or modification to a Third Party Agreement (other than any Sprint Reimbursement Agreement);

iv. 100% Trackwork Plans and Specifications in respect of the UPRR Crossing as referred to in Section 10.1.2.b.i of Schedule 10 (*Design and Construction Requirements*) is approved by UPRR after the Setting Date on terms not materially consistent with the most recent version of such plans and specifications provided as Reference Document 29.10.10.01 on or prior to such date; or

v. [*Reserved.*];

p. the issuance of any temporary restraining order, preliminary or permanent injunction or other form of interlocutory relief by a court of competent jurisdiction that prohibits the prosecution of a material part of the Work;

q. any failure by the City of Denver:

i. to have the EADP (as defined in the Denver IGA) segment from Pond 7A (Brighton West Pond) to the South Platte River operational by June 1, 2018;

ii. to have the portion of the EADP not referred to in paragraph q.i. of this definition operational by September 1, 2019;

iii. to have the TBDP (as defined in the Denver IGA)

operational by September 1, 2019; or

iv. to construct the TBDP (including, for certainty, the EADP) materially in accordance with the specifications in the Denver IGA; and

r. any Extended Event that is not otherwise a Compensation Event specified in any of paragraphs a. to q. of this definition to the extent that such Extended Event constitutes a Compensation Event pursuant to Section 33.1.6.c.i.A;

in each case unless and to the extent such event arises as a result of any breach of Law, Governmental Approval, Permit or this Agreement, or fraud, willful misconduct, criminal conduct, recklessness, bad faith or negligence by or of any Developer-Related Entity.

"Construction Closure Deduction" means, in respect of each full or partial Closure Deduction Period that commences in respect of:

a. any Non-Permitted Construction Closure on I-70 Mainline, I-270 or I-225, in respect of the Closure of each lane, shoulder or ramp; or

b. any other Non-Permitted Construction Closure, in respect of the Closure of each lane, shoulder, ramp, sidewalk or driveway.

"Construction Contract" means the contract for the performance of the Construction Work and of the O&M Work During Construction entered into between Developer and the Construction Contractor in compliance with Section 17.

"Construction Contractor" means the design and construction contractor engaged by Developer under the Construction Contract.

"Construction Period" means the period that begins on the earlier to occur of the date of issuance of NTP1 and the Financial Close Date and ends on (and including) the Substantial Completion Date.

"Construction Goal Deduction" means the amount determined as "CGD" in accordance with Section 1(c) of Part 1 of Schedule 6 (*Performance Mechanism*).

"Construction Period OJT Goal" has the meaning given to it in Section 6.3.1.a of Schedule 15 (*Federal and State Requirements*).

"Construction of Relocation Acceptance Letter" or "CRAL" means a letter in the form set out in Appendix D to Section 4 of Schedule 10 (*Design and Construction Requirements*).

"Construction Price"

"Construction Standards" means:

a. the standards and specifications listed in Schedule 10A (*Applicable Standards and Specifications*) including, for certainty:

i. the CDOT Standard Specifications; and

ii. the Standard Special Provisions;

b. the Project Special Provisions;

c. any other standards and specifications expressly referenced

in this Agreement as applicable to the Construction Work (for certainty, excluding any Laws, Governmental Approvals or Permits); and

d. any other standards and specifications that apply to the Construction Work (excluding, for certainty, any Laws, Governmental Approvals or Permits), including as a result of Developer's methods of performing the Construction Work,

in each case in the form published or otherwise in effect as of the Final Project Information Date and as modified by the express terms of this Agreement (subject to change, addition or replacement made pursuant to Section 8.6).

"Construction Work" means all administrative, design, installation, compliance, permitting, support services, Utility Work, construction related obligations and all other tasks to be performed and provided by Developer required to comply with all requirements set out in Schedule 10 (*Design and Construction Requirements*) and any other provisions of this Agreement applicable to the performance of the Construction Work.

"Construction Work Small Business Goals" has the meaning given to it in Section 6.2.1 of Schedule 15 (*Federal and State Requirements*).

"Construction Work Value" means:

a. the Construction Price; *minus*

b. the Cost to Complete; *minus*

c. the amount of any Milestone Payments previously paid to Developer, where (for purposes of this paragraph c.) any amounts set-off by the Enterprises against any such payments pursuant to Section 5 of Part 3 of Schedule 4 (*Payments*) shall be counted as having been paid to Developer.

"Consumptive Use" means water that is permanently withdrawn from its source system, as further defined by Law.

"Contract Drawings" means the documents included in Schedule 10B (*Contract Drawings*).

"Contract Year" means a period of twelve months commencing on (and including) July 1 of each Calendar Year, provided that:

a. the first Contract Year shall be the period commencing on (and including) the Agreement Date and ending on the immediately following June 30; and

b. the final Contract Year shall be the period commencing on (and including) July 1 immediately preceding the last Calendar Day of the Term and ending on that last Calendar Day of the Term,

where each of June 30 and July 1 shall be determined by reference to the time and date in Denver, Colorado.

"Contractor Bond" means any:

a. payment and performance surety bond(s) which bonds shall be:

i. provided by and maintained with an Eligible Surety;

ii. comprised either of:

A. a single payment and performance surety bond substantially in the form set out in Part A of Schedule 20 (*Forms of Contractor Bonds*); or

B. separate payment and performance surety bonds substantially in the forms set out in, respectively, Parts B and C of Schedule 20 (*Forms of Contractor Bonds*); and

iii. in a penal amount of not less than:

A. with respect to any individual bond delivered pursuant to Section 9.3.1.a.i (for purposes of which, each bond delivered in accordance with paragraph a.ii.B. of this definition shall constitute a separate individual bond), 50% of the aggregate value of all the Construction Work and the O&M Work During Construction to be performed during the Construction Period under the Principal Subcontracts (provided that, in the event of any self-performance of the O&M Work During Construction by Developer, the value of the O&M Work During Construction shall be deemed to equal (or, in the event that Developer is only partially self-performing such Work, for purposes of determining such penal amount, the value of the O&M Work During Construction shall be the value thereof to be performed under the Principal Subcontracts added to) Developer's budgeted amount for such self-performed O&M Work During Construction, as such budgeted amount shall be verified by the Enterprises (acting reasonably)); and

B. with respect to any individual bond delivered pursuant to Section 9.3.1.a.ii (for purposes of which, each bond delivered in accordance with paragraph a.ii.B. of this definition shall constitute a separate individual bond), 100% of the maximum amount payable by Developer to the O&M Contractor under the O&M Contract in the then current Contract Year (provided that, in the event of any self-performance of the O&M Work by Developer, such maximum amount shall be deemed to equal (or, in the event that Developer is only partially self-performing such Work, such penal amount shall be determined by adding such maximum amount to) Developer's budgeted amount for such self-performed O&M Work in such Contract Year, as such budgeted

amount shall be verified by the Enterprises (acting reasonably)),

or, in any case, if greater or with respect to any other part of the Work, the minimum required by Law, including C.R.S. § 38-26-106; and

iv. otherwise provided in compliance with Section 9.3.1; or

b. any alternative form of payment and/or performance security provided with the Enterprises' Acceptance pursuant to Section 9.3.3.

"Control" of a Person by another Person means that other Person (whether directly or indirectly):

a. holds either:

i. at least 25% or more of the equity interests in such Person; or

ii. a percentage of the equity interests in such Person that is either equal to or greater than the percentage held by any other holder; or

b. has the right to appoint, approve or remove:

i. at least 25% of the board of directors (or equivalent) of such Person; or

ii. a percentage of the board of directors (or equivalent) of such Person either equal to or greater than the percentage appointed, approved or removed by any other holder; or

c. exercises control over the direction of the business, management and/or policies of such Person, including through:

i. preferred or minority equity holder veto or voting rights (whether such rights are provided by Law or by such Person's organizational documents or related member or shareholder agreements or similar agreements); or

ii. any other means,

in the case of paragraphs c.i and c.ii. to the extent such rights or other means circumvent, or appear intended to circumvent, any restrictions or obligations that would otherwise arise if this definition of Control applied.

"Control Center" means Developer's control center for controlling the Cover MEP Systems.

"Controlling Work Item" means the Activity or work item on the Critical Path (or any Payment Milestone critical path) having the least amount of Float.

"CORA" means the Colorado Open Records Act.

"CORA Exempt Materials" means any trade secrets, privileged information and confidential commercial, financial, geological or geophysical data exempt from public disclosure under C.R.S. §§ 24-72-204(3)(a)(IV) or information that is

otherwise exempt from disclosure under CORA.

"Core Proposer Team Member" means each of the following in its capacity as a "Core Proposer Team Member" as defined in the ITP:

a. Meridiam I-70 East CO, LLC;

b. Kiewit Development Company;

c. Kiewit C70 Investors, LLC;

d. Kiewit Infrastructure Co.;

e. Parsons Brinckerhoff;

f. Roy Jorgensen Associates, Inc.

g. Meridiam Infrastructure North America Fund II; and

h. Kiewit Infrastructure Group, Inc.

"Corrective Action" has the meaning given to it in Section 6.5.8 of Schedule 8 (*Project Administration*).

"Corrective Action Plan" means Developer's plan for taking Corrective Action in respect of systemic Nonconforming Work.

"Cost to Complete" means (without double-counting):

a. those costs (internal and external) that the Enterprises reasonably and properly project that they (and/or CDOT) will incur in carrying out any process to request bids from any parties interested in entering into one or more contracts with the Enterprises (and/or CDOT) to conduct all Work prior to and as necessary to achieve Final Acceptance, including all costs related to the preparation of bid documentation, evaluation of bids and negotiation and execution of relevant contracts; *plus*

b. the costs that the Enterprises reasonably and properly project that they (and/or CDOT) will incur in performing or having performed all Work prior to and as necessary to achieve Final Acceptance; *plus*

c. any Losses resulting from the actions of Developer and any other Developer-Related Entity that the Enterprises (and/or CDOT) would, but for the termination of this Agreement, not have incurred prior to Final Acceptance; *minus*

d. any insurance proceeds and proceeds of Contractor Bonds available to the Enterprises (and, for certainty, not available to the Lenders) for the purposes of achieving Final Acceptance.

"Courtesy Patrol Service Plan" means the plan referred to in Section 9.2.2.c of Schedule 11 (*Operations and Maintenance Requirements*).

"Cover" means the Elements to be constructed by Developer within the limits depicted in the I-70 Cover Plans, which (except to the extent otherwise specified in this Agreement) includes both "Planning Area 1" and "Planning Area 2" as depicted in the I-70 Cover Plans.

"Cover Maintenance Agreement" means the Intergovernmental Agreement among CDOT, HPTE, BE and the City of Denver in relation to the Project, a draft of which agreement was provided to the Preferred Proposer as Reference Document number 29.10.14.10.

"Cover MEP System" means the mechanical, electrical, and plumbing system and ITS and communications systems identified in Section 12 of Schedule 10 (*Design and Construction Requirements*) required for the Cover and the Lowered Section between Brighton Blvd. and Dahlia St.

"Cover O&M Work" means all O&M Work with respect to the Cover in relation to:

a. the Cover MEP System and associated Elements thereof described in Section 12 of Schedule 10 (*Design and Construction Requirements*);

b. fencing and associated support Elements at the east and west limits of the Cover;

c. all structural connections or anchors that connect to structures on top of the Cover and are embedded in or connect through the deck slab;

d. until the end of the Landscape Warranty period (as described in Section 14.11 of Schedule 10 (*Design and Construction Requirements*)), all landscaping, plant, soil and other vegetation and all irrigation systems; and

e. all Elements at and below (A) the protection course and root barrier protection at landscape areas and (B) the protection course at vehicular and pedestrian traffic areas (including, for certainty, the Elements referred to in paragraphs h.i to h.iv of the definition of Cover Top O&M Work in this Annex A), including:

i. structural Elements, such as deck, girders, bearings, abutments, deck joints, retaining walls, columns, piers, pier caps and approach slabs;

ii. foundation, backfill, and subsurface Elements;

iii. drainage Elements;

iv. roadway Elements; and

v. all Elements identified as Developer's responsibility in Appendix E to Section 4 of Schedule 10 (*Design and Construction Requirements*).

"Cover Top Maintainer" means the City of Denver and any entity contracted by the City of Denver from time to time to carry out the Cover Top O&M Work.

"Cover Top O&M Manual" has the meaning given to it Section 3.2.3.e of Schedule 11 (*Operations and Maintenance Requirements*).

"Cover Top O&M Work" means any and all operations, management, administration, maintenance, repair, preservation, modification, reconstruction, rehabilitation, restoration, renewal and replacement work and activities undertaken after the Final Acceptance Date or (in the case of the elements referred to in paragraphs a. and b. of this definition) after the end of the Landscape Warranty period (as described in Section 14.11 of Schedule 10 (*Design and Construction Requirements*)) in relation to all Elements with respect to the Cover above

(A) the protection course and root barrier protection at landscape areas and (B) the protection course at vehicular and pedestrian traffic areas, including:

a. all landscaping, planting, soil, and other vegetation;

b. all irrigation systems;

c. all drainage systems;

d. all park, pedestrian, cyclist, and other aesthetic and urban amenities, features, site furnishings, buildings and structures, such as any shade coverage and any walls;

e. all lighting, electrical and mechanical components and equipment;

f. all road, cycling, pedestrian, and park, playground, and field surfaces (including, for example, unit paving, concrete or asphalt paving, curbs, crush stone surfacing, playground surfacing, and synthetic field) and any associated grading and overlay;

g. all barriers, gates, fences (other than the fencing referred to in paragraph b. of the definition of Cover O&M Work in this Part A of Annex A (*Definitions and Abbreviations*)), bollards, posts, poles and railings;

h. all elements of the Project Special Provision Section 519 Garden Roof Assembly (as described in Appendix A of Section 14 of Schedule 10 (*Design and Construction Requirements*)), excluding:

i. the monolithic waterproofing membrane;

ii. any reinforcing and flashing;

iii. the protection course and root barrier protection at landscape areas;

iv. the protection course at vehicular and pedestrian traffic areas,

and, for certainty, including all other elements of such "Garden Roof Assembly" including:

v. insulation (EPS geofoam);

vi. drainage / water retention components;

vii. filter fabrics;

viii. soil;

ix. garden roof accessory components; and

x. erosion control materials; and

i. all other elements described in Section 14 of Schedule 10 (*Design and Construction Requirements*) that do not fall within the scope of the Cover O&M Work,

provided that Cover Top O&M Work shall exclude:

j. any O&M Work that falls within paragraphs a., b., c. and d. of the definition of Cover O&M Work in this Part A of Annex A (*Definitions and Abbreviations*); and

k. any Work required to be undertaken by Developer pursuant to Section 9 as a result of any breach of any Warranty in relation to any of the elements of the Cover falling within the scope of this definition.

"CP Deduction Month" has the meaning given to it in Section 1(a) of Part 1 of Schedule 6 (*Performance Mechanism*).

"CPI" means the Consumer Price Index All items (BES Series ID CUUR0000SA), as published by the United States Department of Labor, Bureau of Labor Statistics, for which the base year is 1982-84 = 100, or if such publication ceases to be in existence, a comparable index selected by the Enterprises and approved by Developer, acting reasonably, provided that:

a. if the CPI is revised so that the base year differs from that set out above, the CPI shall be converted in accordance with the conversion factor published by the Bureau of Labor Statistics; and

b. if the Bureau of Labor Statistics otherwise alters its method of calculating such index, the Parties shall mutually determine appropriate adjustments in the affected index.

"Critical Path" means the longest sequence, in terms of time, of logically connected Activities on the Project Schedule ending with Final Acceptance, and, for certainty, the Project Schedule shall include only a single Critical Path.

"Critical Path Method" means the scheduling technique showing all Activities required to complete a task, complete with durations and relationships between Activities.

"Critical Velocity" means the minimum longitudinal air velocity required to prevent backflow of smoke, and which is a function of tunnel geometry and design fire characteristics.

"Cross Drain" means pipes or culverts that convey water without interruption from one side of a road to the other.

"CRPM" has the meaning given to it in Section 1.1.1 of Schedule 15 (*Federal and State Requirements*).

"Cure Period" means, for any Noncompliance Event, the "Cure Period" (if any) specified for such Noncompliance Event in Table 6A.1 or Table 6A.2, as applicable, which shall commence on and from the Noncompliance Start Time of such Noncompliance Event.

"Default Interest" means interest accruing at the Default Interest Rate on a payment that is due but unpaid.

"Default Interest Rate" means, for each Calendar Day during which Default Interest accrues pursuant to this Agreement, the rate per annum equal to the 30 Calendar Day British Bankers Association LIBOR Rate ("BBA LIBOR"), as published by Reuters (or other commercially available source providing quotations of BBA LIBOR as designated by the Enterprises from time to time) at approximately 11:00 a.m., London time for dollar deposits (for delivery on the first Calendar Day on which Default Interest is due) plus 200 basis points, provided that if such rate is not available at such time for any reason, then the Default Interest rate shall be the rate per annum determined by the Enterprises as provided by a similar organization.

"Defect" means a defect, howsoever caused, affecting the condition, use, functionality or operation of any Element.

"Defect Remedy Period" means (subject to any extension pursuant to Section 12.5.2):

a. for a Category 1 Defect, the maximum time period for taking and completing the action required by Section 4.2.2 of Schedule 11 (*Operations and Maintenance Requirements*), being the time period set out in the column headed "Cat 1 Immediate Action" in the Performance and Measurement Tables; or

b. for a Category 2 Defect, the maximum time period for taking and completing the action required by Section 4.2.3 of Schedule 11 (*Operations and Maintenance Requirements*), being the time period set out in the column headed "Cat 2 Permanent Repair" in the Performance and Measurement Tables,

in each instance commencing from the time that Developer first becomes (or should have become) aware of the existence of the relevant O&M Defect, provided that, for certainty, if any such period is specified as "N/A", the relevant O&M Defect shall be deemed to have no remedy period or, for the purposes of Schedule 6 (*Performance Mechanism*), no Cure Period.

"Deferred Compensation" means any adjustment made under Sections 15.4.a.iii or 15.6.3.b or any deferred payments made under Section 15.4.a.ii.

"Deferred Equity Amounts" means any unfunded or undisbursed amount of any Committed Investment that is shown in the Financial Model to be available for use prior to the anticipated Substantial Completion Date, which amount is:

a. of a type defined in paragraph a. of the definition of Committed Investment in this Part A of Annex A (*Definitions and Abbreviations*); or

b. of a type defined in paragraph b. of the definition of Committed Investment in this Part A of Annex A (*Definitions and Abbreviations*).

"Delay Financing Costs" means, in respect of any Delay Period, the aggregate of:

a. all amounts of principal that accrue with respect to the Long Term Project Debt under the Financing Documents during such period;

b. all amounts of interest (excluding default interest), together with any commitment or standby fees on undrawn loan facilities that will accrue under the Financing Documents with respect to the Long Term Project Debt during such period; and

c. reasonable financing costs and expenses that accrue during such period with respect to the Long Term Project Debt in connection with any of the foregoing.

"Delay Period" has the meaning given to it in Section 15.3.1.c.ii.

"Delay Relief Events" has the meaning given to it in paragraph a. of the definition of Relief Event in this Part A of Annex A (*Definitions and Abbreviations*).

"Deliverable" means any written document, drawing, report, plan or other material or information, regardless of form and including any draft, required pursuant to this Agreement to be submitted or resubmitted to the Enterprises or the Department, as applicable, for Approval, Acceptance, any other consent, approval or like assent, or Information, excluding, for certainty, notices and correspondence.

"Deliverables Tables" has the meaning given to it in Section 1(a) of Part 1 of Schedule 3 (*Commencement and Completion Mechanics*).

"Denver IGA" means the Intergovernmental Agreement among CDOT, HPTE, BE and the City of Denver dated as of September 14, 2015, as supplemented by the letters dated February 21, 2017 and April 21, 2017, copies of which were included in the Reference Documents.

"Denver Planned Projects" means the projects listed in Appendix B to Section 9 of Schedule 10 (*Design and Construction Requirements*).

"Department" means:

a. CDOT acting pursuant to a delegation of authority by the Enterprises pursuant to Section 18.1.2; or

b. the Enterprises, but only if and to the extent that:

i. the context may require; or

ii. the Enterprises otherwise notify Developer.

"Department Provided Approvals" means:

a. each of the Governmental Approvals listed in Table 9-1 in Section 9.4.15 of Schedule 10 (*Design and Construction Requirements*);

b. each of the Governmental Approvals listed in Table 17-1 of Schedule 17 (*Environmental Requirements*); and

c. the "Interstate Access Request" identified in the Reference Documents.

"Design of Relocation Acceptance Letter" or "DRAL" means a letter in the form set out in Appendix C to Section 4 of Schedule 10 (*Design and Construction Requirements*).

"Designated Senior Representative" means:

a. in the case of Developer, its Project Manager (or, if none, an equivalent successor representative as notified by Developer to the Enterprises from time to time); and

b. in the case of the Enterprises, the director of HPTE (or an equivalent successor representative of HPTE or BE as notified by the Enterprises to Developer from time to time).

"Detailed Supervening Event Submission" has the meaning given to it in Section 15.1.2.b.ii.

"Deterioration Fraction" has the meaning set out in Section 4.3.a of Schedule 12 (*Handback Requirements*).

"Developer" has the meaning given to it in the Preamble.

"Developer Change" means a Change initiated by Developer pursuant to a Developer Change Notice.

"Developer Change Notice" has the meaning given to it in Section 14.1.b.

"Developer Conditions Precedent" means the conditions set out in Section 2.2 of Schedule 1 (*Financial Close*).

"Developer Default" has the meaning given to it in Section 32.1.1.

"Developer Default Cure Period" has the meaning given to it in Section 32.1.1.

"Developer Employee Redundancy Payments" means the amount of all payments of wages earned, accrued unused vacation time, and any other payments required by Law or required by Developer's employment agreement with Developer's employees, which in each case have been or will be reasonably incurred by Developer as a direct result of termination of this Agreement.

"Developer-Related Entities" means:

a. Developer;

b. the Equity Members;

c. any Indirect Equity Members;

d. Subcontractors (of any tier);

e. any other Persons (except, for certainty, the Enterprises) performing any of the Work for or on behalf of Developer;

f. any other Persons (except, for certainty, the Enterprises and any members of the general public that use or access the Project) for whom Developer may be legally or contractually responsible; and

g. the employees, agents, officers, directors, representatives and consultants of any of the foregoing.

"Developer Release of Hazardous Substances" means any Release of Hazardous Substances on, in, under, from or in the vicinity of the Site caused by Developer or any other Developer-Related Entity to the extent such Release:

a. arises as a result of any breach of Law, Governmental Approval, Permit or this Agreement, fraud, willful misconduct, criminal conduct, recklessness, bad faith or negligence by or of Developer or any other Developer-Related Entity; or

b. constitutes the Release of Hazardous Substances arranged to be brought onto the Site by Developer or any other Developer-Related Entity.

"Developer Retained Expansion" means any Other Department Project, or other facility, constructed by a Person other than Developer, that the Enterprises require Developer to operate and/or maintain pursuant to this Agreement, including pursuant to an Enterprise Change documented in a Change Order.

"Developer-risk Permit Area"	means any Permit Area: a. which is adjacent to the Additional Right-of-Way but not the Right-of-Way; and/or b. for which access and/or use is required to be procured by Developer pursuant to a Permit for which Developer bears all risk of delay and/or all risk of cost pursuant to Section 8.4.3.b.
"Developer's Enterprise Change Response"	has the meaning given to it in Section 1.1.c.i of Schedule 24 (*Change Procedure*).
"Developer's Representative"	has the meaning given to it in Section 18.2.1.a.
"Directive Letter"	has the meaning given to it in Section 1.4.a of Schedule 24 (*Change Procedure*).
"Disadvantaged Business Enterprise"	a State-certified "Disadvantaged Business Enterprise" listed on the Colorado Unified Certification Program DBE Directory.
"discretion"	has the meaning given to it in Section 2.2.2.b.
"Discriminatory Change in Law"	means a Change in Law, the terms of which only apply to: a. the Project, or the Project and Similar Projects; and/or b. Developer or any Principal Subcontractor and not to other Persons (unless such Persons are public-private partnership project developers or design-build contractors engaged in Similar Projects (and in roles similar to Developer or such Principal Subcontractor on such projects)), and in the case of each of paragraphs a. and b. excluding any Change in Law to the extent such is made in response to any breach of Law, Governmental Approval, Permit or this Agreement, or fraud, willful misconduct, criminal conduct, recklessness, bad faith or negligence of any Developer-Related Entity.
"Dispute"	means any dispute between the Enterprises and Developer arising out of or in connection with this Agreement.
"Dispute Resolution Panel" or "Panel"	means either the Commercial Panel or the Technical Panel.
"Dispute Resolution Procedure"	means the procedure for the resolution of Disputes set out in Section 38 and Schedule 25 (*Dispute Resolution Procedure*).
"Distribution"	means, whether in cash or in kind any: a. dividend or other distribution by Developer in respect of share capital (or the equivalent); b. reduction of capital, redemption or purchase of shares or any other reorganization or variation to share capital; c. payments by Developer under any Equity Member Funding Agreements (whether of principal, interest, Breakage Costs or otherwise); d. payment, loan, contractual arrangement or transfer of assets or rights to the extent (in each case) was neither in the ordinary course of business nor on reasonable

commercial terms; or

e. the receipt of any other benefit that is not received in the ordinary course of business and on reasonable commercial terms.

"Document Control System" means the system established and maintained by Developer pursuant to Section 13.1.1 of Schedule 8 (*Project Administration*).

"DRIR" means the Denver Rock Island Railroad.

"DRIR Crossing" means the existing and/or proposed crossing by the DRIR Railroad through the I-70 East corridor on the Right-of-Way as described in Section 10.1.6 of Schedule 10 (*Design and Construction Requirements*).

"DRIR RRA" means the railroad agreement between CDOT and DRIR in relation to the Project, a draft of which agreement was provided to the Preferred Proposer as one of the Reference Documents numbered 29.10.10.03.

"DRIR Work" means all duties and services to be furnished and provided by the DRIR as required by the DRIR RRA.

"Drop Site" has the meaning given to it in Section 1.2 B of Appendix B of Schedule 11 (*Operations and Maintenance Requirements*).

"DPS MOA" means the Memorandum of Agreement between CDOT and School District No. 1 of the City and County of Denver dated as of October 11, 2016.

"DRTL" has the meaning given to it in Section 7 of Schedule 9 (*Submittals*).

"Durability Plan" means Developer's plan for addressing the durability of all Residual Elements prepared and updated in accordance with Section 8 of Schedule 8 (*Project Administration*).

"E-470 Installation Agreement" means the installation task order in relation to the Project to be executed between HPTE and the ETC System Integrator pursuant to the E-470 TSA.

"E-470 TSA" means the tolling services agreement between HPTE and the ETC System Integrator dated May 7, 2015.

"ECMTP" has the meaning given to it in Section 6.1.1 of Schedule 17 (*Environmental Requirements*).

"ECWP" has the meaning given to it in Section 2.1.1 of Schedule 17 (*Environmental Requirements*).

"Electronic Toll Collection System" means the barrier free, non-cash road charging system, including all signage, civil and telecommunications infrastructure and back-office facilities, that allows free-flow movement for I-70 Mainline users to enter and exit the Tolled Express Lanes without having to stop to pay cash tolls.

"Element" means an individual component, system or subsystem of the Project, which shall, when used in relation to the O&M Work, include at a minimum a breakdown into the items described in the column headed "Element" in the Performance Requirements (as such items are further subdivided into subsections where appropriate).

"Eligible Financial Institution" means a bank or financial institution:

a. having an office in Denver, Colorado or New York, New York at which a letter of credit issued by it can be presented for payment by hand delivery, electronic means or fax; and

b. having a Minimum Issuer Rating from at least two Rating Agencies,

where for purposes of this definition "Minimum Issuer Rating" means a long-term unsecured debt rating of at least:

i. "A-" by Standard & Poor's Ratings Services;

ii. "A-" by Fitch, Inc.;

iii. "A3" by Moody's Investors Service, Inc.; or

iv. "A low" by DBRS, Inc.,

in each case with an outlook of "stable" or better.

"Eligible Insurer" means an insurer that:

a. is either:

i. admitted or authorized in the State; or

ii. if not admitted or authorized in the State, based in Bermuda, the United Kingdom or the Republic of Ireland;

b. except as otherwise Approved by the Enterprises, has either (i) a policyholder's management and financial size category rating of not less than "A-X" according to A.M. Best's Financial Strength Rating and Financial Size Category or (ii) a rating of not less than "BBB" according to Standard and Poor's Ratings Services;

c. is not the subject of:

i. an Insolvency Event; or

ii. a Governmental Authority order or directive limiting its business activities as related to or affecting any Insurance Policies placed or to be placed with such insurer; and

d. satisfies any conditions imposed by the Enterprises as a condition to any Approval given pursuant to paragraph b. of this definition.

"Eligible Surety" means a surety authorized to issue bonds in the State having either:

a. a Minimum Eligible Surety Rating from at least two Rating Agencies; or

b. a rating of at least "A-" and "Class VIII" from A.M. Best Company, Inc. (but only if it is at the relevant time a Registered Rating Agency),

where for purposes of this definition "Minimum Eligible Surety Rating" means a long-term unsecured debt rating of at least:

i. "A" by Standard & Poor's Rating Services;

ii. "A" by Fitch, Inc.;

iii. "A2" by Moody's Investors Service, Inc.; or

iv. "A" by DBRS, Inc.,

in each case with an outlook of "stable" or better.

"Emergency" means any non-ordinary course event affecting the Project, whether directly or indirectly, that:

a. is an immediate or imminent threat, or, if not promptly addressed, a potential threat, to the safety of the public;

b. causes disruption or, if not promptly addressed, has the potential to cause disruption, to the free flow of traffic on or about the Project;

c. is an immediate or imminent threat to the long term integrity of any part of the infrastructure of the Project, to the Environment, any Improvements or to property adjacent to the Project;

d. is recognized by the Enterprises or CDOT as an emergency pursuant to Fiscal Rule 2-2 of the State of Colorado Fiscal Rules; or

e. is recognized or declared as an emergency by the Governor of the State, FEMA, the U.S. Department of Homeland Security or any other Governmental Authority with legal authority to recognize or declare an emergency.

"Emergency Repair Work" means temporary and/or permanent repair work that results from an Emergency of the type specified in paragraph d. or e. of the definition thereof in this Part A of Annex A (*Definitions and Abbreviations*).

"Emergency Services" means any Federal, State or local police, fire, emergency or other public safety Governmental Authorities (including the National Guard), and any other security or emergency personnel acting at the direction of any Governmental Authority.

"Emerging Small Businesses" any business certified by CDOT to participate in CDOT's ESB program that has not otherwise lost such certification due to graduation or revocation.

"Encumbrance" means any mortgage, pledge, hypothecation, deed of trust, mortgage, security interest, lien, financing statement, charge, option, assignment or encumbrance of any kind or any arrangement to provide priority or preference, including any easement, right-of-way, restriction (whether on voting, sale, transfer, disposition, use or otherwise), right, lease and other encumbrance on title to real or personal property (whether or not of record), whether voluntary or imposed by Law, and any agreement to give any of the foregoing.

"Enterprise" and "Enterprises" each has the meaning given to it in the Preamble.

"Enterprise Change" means a Change initiated by the Enterprises pursuant to an Enterprise Change Notice.

"Enterprise Change Notice" has the meaning given to it in Section 14.1.a.

"Enterprise Closing Agreements" means:

a. the Project Agreement Amendment;

b. the Lenders Direct Agreement;

c. each of the Principal Subcontractor Direct Agreements;

d. the bond purchase agreement with respect to any PABs;

e. the continuing disclosure agreement of the Enterprises with respect to any PABs;

f. the trust indenture, and any related supplement indenture, with respect to any PABs;

g. the tax compliance agreement with respect to the PABs;

h. any PABs; and

i. the loan agreement pursuant to which the BE as PABs Issuer loans the proceeds from the sale of any PABs to the Developer.

"Enterprise Conditions Precedent" means the conditions set out in Section 2.3 of Schedule 1 (*Financial Close*).

"Enterprise Default" has the meaning given to it in Section 32.3.1.

"Enterprise Default Cure Period" has the meaning given to it in Section 32.3.1.

"Enterprise Release of Hazardous Substances" means any Release of Hazardous Substances on, in, under, from or in the vicinity of the Site caused by the Enterprises, CDOT or any other State Governmental Authority, including any such Release caused by any Person (other than a Developer-Related Entity) in the course of acting on behalf of the Enterprises, CDOT or any other State Governmental Authority, which Release:

a. occurs:

i. with respect to any ROW Parcel, after the Setting Date; and

ii. with respect to any Additional ROW Parcel, on or after its Project License Start Date;

b. is required to be investigated, removed, treated, stored, transported, managed and/or remediated pursuant to Law, any Governmental Approval or Developer's obligations under this Agreement,

excluding any such Release to the extent such results in the presence of Hazardous Substances in groundwater.

"Enterprise Representative" has the meaning given to it in Section 18.2.1.a.

"Environment" means air, soils, submerged lands, surface waters (including wetlands), groundwaters, land, stream sediments, surface or subsurface strata, biological resources, including endangered, threatened and sensitive species, and natural systems, including ecosystems, historic, archeological and paleontological resources.

"Environmental Approval" means any Governmental Approval or Permit required for the Project or the Work pursuant to Environmental Law (including, for certainty, the FEIS, the ROD and any Reevaluation).

"Environmental Law" means any Law applicable to the Project or the Work requiring consideration of impacts on the Environment or addressing, regulating or imposing liability, actions or standards of conduct that pertains to the Environment, Hazardous

Substances, contamination of any type whatsoever, or environmental health and safety matters, and any lawful requirements and standards that pertain to the Environment, Hazardous Substances, contamination of any type whatsoever, or environmental health and safety matters, set out in any permits, licenses, approvals, plans, rules, regulations, administrative or judicial orders, ordinances or other Governmental Approvals adopted, or other criteria and guidelines promulgated, pursuant to such Law, including in each case those relating to:

a. the manufacture, processing, use, distribution, existence, treatment, storage, disposal, generation, transportation and Release of Hazardous Substances;

b. protection of wildlife, animal or plant species listed as threatened or endangered under and subject to an applicable threatened or endangered species Law, species, other sensitive species, wetlands, water courses and water bodies, antiquities, fossils, coins, articles of value, precious minerals, cultural artifacts, human burial sites and remains and other similar remains of archaeological, cultural or paleontological interest, natural resources, and of the Environment generally;

c. the operation and closure of underground storage tanks;

d. human health and safety; and

e. notification documentation and record keeping requirements relating to the foregoing.

"Environmental Manager" means the "Environmental Manager", initially as identified in Schedule 27 (Key Personnel), subject to replacement pursuant to Section 16.2.

"Environmental Requirements" means the requirements set out in Schedule 17 (*Environmental Requirements*), including the obligation to comply with Environmental Law and all Environmental Approvals.

"Equity IRR" means, as of any date of calculation, the nominal post-tax internal rate of return on the total amount of Committed Investment described in paragraphs a. and b. of the definition of Committed Investment in this Part A of Annex A (*Definitions and Abbreviations*) made and projected, as of such date, to be made over the full Term, which rate of return shall be calculated, using the Financial Model, as the discount rate that, when applied to the equity cash flows calculated as of the relevant date, results in a net present value of zero. For purposes of this definition:

a. the phrase "post-tax" refers only to U.S. Federal and state income tax liability of Developer or its Equity Members, calculated at no greater than the maximum rate charged to domestic corporations and taking into account the deductibility of state and local taxes for Federal purposes, and specifically excludes:

i. any foreign income tax and other tax of any kind; and

ii. any withholding tax for Federal, state or local purposes, including any tax that Developer or an Equity Member is obligated to withhold on Distributions (whether actual or constructive) or

other payments or allocations to Equity Members or holders of debt of or equity interests in an Equity Member under 26 U.S.C. §§ 1441–1446, notwithstanding 26 U.S.C. § 1461;

b. the phrase "equity cash flows" refers to:

i. the total amount of Distributions that, as of the date of calculation, have been made and are projected to be made during the Term; *minus*

ii. the total amount of Investment described in paragraphs a. and b. of the definition of Committed Investment in this Part A of Annex A (*Definitions and Abbreviations*) that, as of the date of calculation, has been made and is projected to be made during the Term; and

c. the Equity IRR as of the Financial Close Date is equal to the Base Case Equity IRR.

"Equity Market Value" means the net present value of the future nominal Distributions (post-tax on the part of Developer but pre-tax on the part of any Equity Member) of the kind referenced in paragraphs a., b. and c. of the definition of Distribution in this Part A of Annex A (*Definitions and Abbreviations*) as anticipated as of the Termination Date, as such net present value is determined by an Independent Market Value Appraiser:

a. utilizing a discount rate that is based on both the performance of the Project and of other projects that are more similar than not to the Project with respect to:

i. risk allocation (including credit risk); and

ii. payment mechanisms (including the absence of any transfer of usage risk to Developer); and

b. assuming:

i. that no Termination for Convenience, termination of this Agreement for Enterprise Default or Termination by Court Ruling that arises by reason of an Enterprise Default, as applicable, has occurred; and

ii. that the shares in Developer are freely transferable and are being sold in the open market; and

iii. that the estimated anticipated future nominal Distributions of the kind referenced in paragraphs a. and c. of the definition of Distribution in this Part A of Annex A (*Definitions and Abbreviations*) (post-tax on the part of Developer but pre-tax on the part of any Equity Member) are based on the performance of the Project up to the Termination Date employing an approach that considers the Financial Model and making any adjustments for positive or negative operating performance that are not yet reflected in the Financial Model,

where such determination:

c. shall be made by such Independent Market Value Appraiser within 90 Calendar Days of its appointment; and

d. except in the case of manifest error or fraud, shall be final and binding on the Parties, unless challenged by either Party within 30 Calendar Days of the date of determination by submission to the Commercial Panel for resolution in accordance with the Dispute Resolution Procedure.

"Equity Member" means any Person with a direct equity interest in Developer.

"Equity Member Debt" means any bona fide indebtedness of Developer for borrowed money that:

a. is held by any Equity Member or an Affiliate thereof; and

b. is subordinated in priority of payment and security to all Project Debt held by Persons who are not Equity Members.

"Equity Member Funding Agreement" means any loan agreement, credit agreement or other similar financing agreement or subordination agreement providing for or evidencing Equity Member Debt.

"Equity Transfer" means:

a. any sale, transfer, assignment, conveyance, or other disposal of any direct or indirect legal, beneficial or equitable ownership interests in a Person; or

b. any agreement, whether or not subject to the occurrence of any condition or exercise of any right or option, to effect any transaction specified in paragraph a. of this definition, including any pledge, mortgage, grant of any security interest, lien or other encumbrance.

"Escrow Agent" means the escrow agent appointed by the Parties pursuant to the Financial Model Escrow Agreement.

"ETC System Integrator" means the E-470 Public Highway Authority, a political subdivision of the State formed under the Public Highway Authority Law, Part 5 of Article 4 of Title 43, C.R.S.

"Exceptional Cost" means, in respect of an Insurance Review Period, the amount, if positive (and, if not, $0), calculated as:

"Exceptional Cost" = Insurance Cost Increase – (20% x Base Benchmarked Insurance Cost in respect of that Insurance Review Period).

"Exceptional Saving" means, in respect of an Insurance Review Period, the amount if positive (and, if not, $0), calculated as:

"Exceptional Saving" = Insurance Cost Decrease – (20% x Proposal Benchmarked Insurance Cost in respect of that Insurance Review Period).

"Excess Costs" means costs and expenses of the following activities as incurred by Developer as a result of the occurrence of a Non-Appendix B Parcel Unexpected Hazardous Substances Event or an Appendix B Parcel Unexpected Hazardous Substances Event in connection with:

a. the off-site transportation and disposal of the relevant Unexpected Hazardous Substance(s):

i. trucking costs from the Site to the applicable disposal site, as such costs and expenses are calculated in accordance with Sections 2.1, 2.3, 2.5

and 2.6 (as applicable) of Appendix A to Schedule 24 (*Change Procedure*); and

ii. tipping fees at such disposal site, as such costs and expenses are calculated in accordance with Sections 2.5 and 2.6 of Appendix A to Schedule 24 (*Change Procedure*); and

b. the on-site investigation, removal, treatment, management and/or remediation of any:

i. non-naturally occurring radioactive waste (excluding such waste resulting from lawful household or medical uses); or

ii. lost or abandoned military-grade munitions (excluding firearms and firearms ammunition) that are at such time primed, fused, armed or otherwise prepared for use and which remain unexploded,

following advance notice of such activities to the Enterprises and other Governmental Authorities in accordance with Law, and with respect to which the Enterprises have not exercised their rights under Section 23.1.3 of Schedule 17 (*Environmental Requirements*) with respect to such materials,

in all cases excluding:

c. any internal costs, fees or expenses of any Developer-Related Entity except to the extent expressly permitted in accordance with Section 2.6 of Appendix A to Schedule 24 (*Change Procedure*) as and to the extent provided for in paragraphs a. and b. of this definition; and

d. any costs or expenses that are expressly provided to be incidental and excluded pursuant to the terms of Schedule 17 (*Environmental Requirements*).

"Excess Groundwater Costs" means any costs and expenses for the following as incurred by Developer:

a. as a result of the occurrence during the Construction Period of any Unexpected Groundwater Contamination Event of the type referenced in paragraph a. of the definition thereof in this Part A of Annex A (*Definitions and Abbreviations*):

i. acquisition or rental costs for equipment used in the treatment and/or remediation (including directly related storage) of groundwater, as such costs and expenses are calculated in accordance with Sections 2.3 and 2.6 of Appendix A to Schedule 24 (*Change Procedure*); and

ii. parts and materials (including chemicals and other substances necessary for the treatment of any Unexpected Groundwater Contamination) necessary for the operation and use of such equipment, or any previously acquired or rented equipment, as such costs and expenses are calculated in accordance with Sections 2.2, 2.3 and 2.6 of Appendix A to Schedule 24 (*Change*

Procedure);

b. as a result of the occurrence during either the Construction Period or the Operating Period of any Unexpected Groundwater Contamination Event of the type referenced in paragraph b. of the definition thereof in this Part A of Annex A (*Definitions and Abbreviations*), any capital expenditure in accordance with GAAP incurred to treat and/or remediate any Unexpected Groundwater Contamination Condition to enable Developer to perform O&M Work After Construction (whether such expenditure is incurred either during the Construction Period or during the Operating Period, provided that such expenditure (even if required to be incurred during the Construction Period) solely and exclusively relates to the performance of O&M Work After Construction) is in excess of that required to be incurred by Developer in complying with its obligations pursuant to Sections 8.4.4.e.iv and 8.4.4.h. of Schedule 10 (*Design and Construction Requirements*); and

c. as a result of the occurrence during the Operating Period of any Unexpected Groundwater Contamination Event of the type referenced in paragraph b. of the definition thereof in this Part A of Annex A (*Definitions and Abbreviations*), any other costs or expenses as described in paragraphs a.v., a.vi. and a.vii. of the definition of Change in Costs in this Part A of Annex A (*Definitions and Abbreviations*) to the extent the incurrence of any such costs or expenses by Developer is necessary as a result of it having incurred any capital expenditure referenced in paragraph b. of this definition (including, for certainty, as a result of the occurrence during either the Construction Period or the Operating Period of any Unexpected Groundwater Contamination Event of the type referenced in paragraph b. of the definition thereof in this Part A of Annex A (*Definitions and Abbreviations*)) and such costs and expenses relate to such capital expenditure,

in all cases:

d. to the extent applicable with respect to paragraphs b. and c. of this definition, as any such amounts are calculated in accordance with Appendix A to Schedule 24 (*Change Procedure*); and

e. excluding:

i. any internal costs, fees or expenses of any Developer-Related Entity except to the extent expressly permitted in accordance with Section 2.6 of Appendix A to Schedule 24 (*Change Procedure*) either (A) as and to the extent provided for in paragraphs a.i. and a.ii. of this definition or (B) with respect to the costs and expenses calculated pursuant to paragraphs b. and c. of this definition; and

ii. any costs or expenses that are expressly provided to be incidental and excluded pursuant to the terms

of Schedule 17 (*Environmental Requirements*).

"Exclusion" has the meaning given to it in Developer Default number (10) in Section 32.1.1.

"Excused Closure" means:

a. any Closure arising as a direct result of:

i. a Compensation Event;

ii. a Relief Event;

iii. an Emergency;

iv. the performance of Snow and Ice Control Services in accordance with the requirements of Section 11 of Schedule 11 (*Operations and Maintenance Requirements*); or

v. Work required to be performed in connection with the removal of debris or obstructions, patrols or inspections that requires the Closure of a shoulder where such Closure is too brief to require the implementation of a Closure in accordance with Developer's most recently Approved Transportation Management Plan;

b. any Closure under the control of the Emergency Services;

c. any Closure that:

i. was previously under the control of the Emergency Services; and

ii. continues to subsist after the Emergency Services have returned operational control of all parts of the Project affected by such Closure to Developer, provided that, if any such Closure continues to subsist for a period in excess of 30 minutes after such control has been returned to Developer, any such excess period shall not be an Excused Closure;

d. any Closure expressly ordered by, and continuing only for so long as ordered by, the Enterprises, CDOT or any Governmental Authority;

e. any Closure of a shoulder that is required for the sole purpose of performing the repair of a Category 1 Defect, but only to the extent that any such Closure persists for no longer than the Defect Remedy Period applicable to the relevant Category 1 Defect; or

f. any Closure required solely by the ETC System Integrator for the performance of its obligations pursuant to the E-470 TSA or the E-470 Installation Agreement, provided that, for certainty, to the extent that Developer performs any Work on the portion of the Project that is subject to such a Closure during such Closure, such Closure shall not be an Excused Closure within this paragraph f.;

but only to the extent that, in the case of any such Closure:

g. such Closure does not arise as a result of any breach of Law, Governmental Approval, Permit or this Agreement, fraud, willful misconduct, criminal conduct, recklessness, bad faith or negligence by or of any Developer-Related Entity; and

h. Developer is using its Reasonable Efforts to:

i. mitigate the impact of the relevant Closure;

ii. reopen the affected part(s) of the Project as quickly as possible to traffic; and

iii. if such Closure arose as the direct result of an Emergency, respond to the Emergency in accordance with the requirements of this Agreement.

"Exempt Refinancing" means:

a. any Refinancing that was fully and specifically identified and taken into account in the Base Financial Model and calculation of the Base Case Equity IRR and that, at the time of Refinancing, does not lead to a Refinancing Gain greater than zero;

b. amendments, modifications, supplements or consents to Financing Documents, excluding extensions and renewals, and the exercise by a Lender of rights, waivers, consents and similar actions, in each case:

i. in the ordinary course of day-to-day loan administration and supervision; and

ii. that do not individually or in the aggregate provide a financial benefit to Developer;

c. any changes in taxation or Developer's accounting treatment or policies; and

d. any of the following acts by a Lender of senior lien priority Project Debt (including, for certainty, any TIFIA Loan):

i. the syndication of any of such Lender's rights and interests in the senior Financing Agreements;

ii. the grant by such Lender of any rights of participation, or the disposition by such Lender of any of its rights or interests, in respect of the senior Financing Agreements in favor of any other Lender of senior lien Project Debt or any other investor; or

iii. the grant by such Lender of any other form of benefit or interest in either the senior Financing Agreements or the revenues or assets of Developer,

whether by way of security or otherwise, in favor of any other Lender of senior lien Project Debt or any investor;

e. any amendment, modification, or supplement of any Financing Document entered into:

i. in connection with the financing of Deferred

Compensation pursuant to Section 15.5; or

ii. to reflect a corresponding amendment to, modification of, or Change under, this Agreement;

f. a reset of an interest rate and/or mandatory tender pursuant to the express terms of any Financing Documents; or

g. any sale of any equity interests in Developer by an Equity Member or securitization of the existing rights and/or interests attaching to any equity interests in Developer or any of its Equity Members, if any.

"Existing CDOT Right-of-Way" means that portion of CDOT's existing I-70 East corridor right-of-way identified in the Right-of-Way Exhibits in the Contract Drawings.

"Exit Zone" means the length of roadway between the Interior Zone and the exit Portal and which has variable illumination based upon the scene luminance exiting the Portal.

"Expiry Date" means the 30th anniversary of the Baseline Substantial Completion Date.

"Extended Event" has the meaning given to it in Section 33.1.6.a.

"Federal Law" means all Law of the Federal government of the United States of America.

"FEIS" has the meaning given to it in the Recitals.

"FEMA" means the Federal Emergency Management Agency.

"FHWA" has the meaning given to it in the Recitals.

"FHWA 1273" has the meaning given to it in Section 2.5.1 of Schedule 15 (*Federal and State Requirements*).

"Final Acceptance" means the satisfaction of all Final Acceptance Conditions, as confirmed by the Enterprises' issuance of the Final Acceptance Certificate.

"Final Acceptance Certificate" has the meaning given to it in Section 5(a) of Part 6 of Schedule 3 (*Commencement and Completion Mechanics*).

"Final Acceptance Conditions" has the meaning given to it in Section 1 of Part 6 of Schedule 3 (*Commencement and Completion Mechanics*).

"Final Acceptance Date" has the meaning given to it in Section 5(a) of Part 6 of Schedule 3 (*Commencement and Completion Mechanics*).

"Final Acceptance Deadline Date" means the date which is 120 Calendar Days after the Substantial Completion Date, as such deadline may be extended from time to time pursuant to:

a. Section 15.3.1.c.iii.C, as a result of the occurrence of a Supervening Event; or

b. a Change documented in a Change Order.

"Final Handback Inspection Report" means the report prepared by Developer in accordance with Section 3.12 of Schedule 12 (*Handback Requirements*).

"Final Payment Month" means the final month that commences during the Operating Period.

"Final Project Information Date" means the Setting Date, except that in respect of:

a. the Baseline TIFIA Term Sheet, it means July 22, 2017;

b. the IAA, it means August 22, 2017, other than with respect to the first amendment to such agreement referenced in the definition thereof in this Part A of Annex A (*Definitions and Abbreviations*) in which case it means November 15, 2017;

c. the Supplemental Indenture, it means July 7, 2017;

d. the Central 70 Note, it means July 7, 2017;

e. the Cover Maintenance Agreement, it means July 27, 2017;

f. the Beneficial Reuse and Materials Management Plan, it means September 12, 2017;

g. the CDOT Standard Specifications, it means October 1, 2017;

h. the URA with Phillips 66 Company, it means June 6, 2017;

i. the UPRR RRA, it means October 23, 2017, other than with respect to the exhibits to such agreement in which case it means October 31, 2017; and

j. the DRIR RRA, it means October 23, 2017, other than with respect to the exhibits to such agreement in which case it means November 15, 2017.

"Final Warning Notice" has the meaning given to it in Section 22.2.2.

"Financial Close" has the meaning given to it in Section 2.1(a) of Schedule 1 (*Financial Close*).

"Financial Close Base CPP" has the meaning given to it in Section 5(d) of Annex A to Schedule 1 (*Financial Close*).

"Financial Close Date" means the date on which Financial Close occurs.

"Financial Close Deadline" means January 28, 2018, as such deadline may be extended from time to time pursuant to:

a. Sections 4.2(d) or 4.3(c) of Schedule 1 (*Financial Close*); or

b. a Change documented in a Change Order.

"Financial Close Security" means:

a. either:

i. one or more letters of credit in the aggregate amount of at least , each issued by an Eligible Financial Institution; or

ii. one or more surety bonds in the aggregate amount of at least , each issued by an Eligible Surety,

in either case delivered by Developer pursuant to Section 7.3.1.f. of Part C of the ITP on or prior to the Agreement Date; and

b. any replacement letter of credit or surety bond, as applicable, delivered pursuant to Section 1.2(b) of

Schedule 1 (*Financial Close*) that is in the same form as any letter of credit or surety bond, as applicable previously delivered pursuant to Section 7.3.1.f. of Part C of the ITP or otherwise in such other form as the Enterprises may Approve,

where, for certainty, the Financial Close Security may not be in the form of both (x) one or more such letters of credit and (y) one or more such surety bonds.

"Financial Close Termination Amount" means:

a. ; *plus*

b. the lesser of:

i. Developer's reasonable and documented costs and expenses incurred in connection with:

A. execution of this Agreement;

B. the performance of any NTP1 Work; and

C. its efforts to achieve Financial Close (including, for certainty, any cost and expense of extending the expiration date of the Financial Close Security pursuant to Section 4.2(d) of Schedule 1 (*Financial Close*)),

after the issuance of the Notice of Award and through but not including the date of delivery of any notice of termination pursuant to Schedule 1 (*Financial Close*); and

ii. (or, in the event that the Enterprises extend the Financial Close Deadline pursuant to Section 4.2(d) of Schedule 1 (*Financial Close*),).

"Financial Model" means the updated Base Financial Model delivered by Developer pursuant to Schedule 1 (*Financial Close*), as subsequently replaced from time to time pursuant to Section 28.6 or Section 29.2.3.

"Financial Model Escrow Agreement" means the Financial Model Escrow Agreement executed by the Parties and U.S. Bank National Association as Escrow Agent in substantially the form of Schedule 23 (*Form of Financial Model Escrow Agreement*) on or about the date hereof or any replacement agreement entered into by the Parties.

"Financial Proposal Deadline" means August 1, 2017.

"Financing Agreements" means:

a. the documents listed in Section A of Annex A to the Lenders Direct Agreement, executed on or about the Financial Close Date;

b. any other loan or credit agreement, trust indenture, hedging agreement, interest rate swap agreement or other agreement by, with or in favor of any Lender pertaining to Project Debt (including any Refinancing), other than

Security Documents;

c. any note, bond or other negotiable or non-negotiable instrument evidencing the indebtedness of Developer for Project Debt (including any Refinancing); and

d. any amendment, supplement, variation or waiver of any of the foregoing agreements or instruments.

"Financing Documents" means the Financing Agreements and the Security Documents.

"First Payment Month" means the month referred to in paragraph b. of the definition of Payment Month in this Part A of Annex A (*Definitions and Abbreviations*).

"Float" means the amount of time that any given Activity or logically connected sequence of Activities shown on the Project Schedule may be delayed before it delays the occurrence of:

a. the Milestone Completion Date for any Payment Milestone;

b. the Substantial Completion Date; and/or

c. the Final Acceptance Date,

where such Float is identified as the amount of time between the early start date and the late start date, or the early finish date and the late finish date, for each and every Activity shown on the Project Schedule.

"Force Majeure Event" means any:

a. war, civil war, invasion or armed conflict;

b. act of terrorism or sabotage;

c. nuclear, chemical or biological contamination or emissions (including as applicable associated radiation), excluding such contamination, the source or cause of which is the result of any actions of, inaction by, or breach of contract or Law by, the Affected Party;

d. blockade or embargo; or

e. labor dispute, including a strike, lockout or slowdown, generally affecting the road construction industry in the Denver metropolitan area or a significant sector of it,

that occurs after the Agreement Date and that materially and adversely affects the performance by either Party or both Parties (each an "Affected Party") of its or their obligations under this Agreement.

"GAAP" means Generally Accepted Accounting Principles in the US as in effect from time to time.

"General Purpose Lane" means a non-tolled travel lane on the I-70 Mainline within the O&M Limits.

"General Requirements" means the requirements set out in the column headed "General Requirement" in the Performance and Measurement Tables.

"Good Industry Practice" means that degree of skill, care, prudence, foresight and practice which would reasonably and ordinarily be expected from time to time of a skilled and experienced professional designer, engineer, constructor, maintainer or operator, as applicable, engaged in the same type of activity in North America as that of Developer, or any other Person to which such term

relates, seeking to comply with all Law and the same type of obligations and responsibilities in North America as the obligations and responsibilities of Developer under this Agreement and/or the obligations and responsibilities of such Person under the same or similar circumstances.

"Governmental Approval" means any approval, authorization, certification, consent, decision, exemption, filing, license, permit, agreement, concession, grant, franchise, registration or ruling issued, granted or required by or with any Governmental Authority (excluding, for certainty, any Public Utility or Railroad) for the performance of any of Developer's obligations under this Agreement.

"Governmental Authority" means any:

a. United States Federal, State or local government, and any political subdivision of any of them; and

b. any interstate, governmental, quasi-governmental, judicial, public, regulatory or statutory instrumentality, administrative agency, authority, body or entity of, or formed by, any such government or subdivision thereof,

in each case other than the Enterprises.

"Grace Period" means, subject to Section 1.2(b)(i) of Part 6 of Schedule 6 (*Performance Mechanism*), for any Noncompliance Event, the "Grace Period" (if any) specified for such Noncompliance Event in Table 6A.1 or Table 6A.2, as applicable, which period shall commence on and from the Noncompliance Start Time of such Noncompliance Event and shall end at the same time of day as such Noncompliance Start Time on the day which is the number of days specified as the "Grace Period" for such Noncompliance Event after the day on which such Noncompliance Start Time occurs.

"Groundwater Contamination Event Period" means, with respect to any Unexpected Groundwater Contamination Condition that occurs during the Construction Period, the then current three month period ending on March 31, June 30, September 30 or December 31, as applicable.

"Guarantor" means any parent company guarantor of a Principal Subcontractor's obligations under its Principal Subcontract.

"Handback Certificate" has the meaning given to it in Section 3.12.d of Schedule 12 (*Handback Requirements*).

"Handback Deliverable" means any of the following:

a. the Handback Schedule ;

b. the Residual Life Methodology Report;

c. each Asset Condition Report;

d. the Initial Handback Inspection Report;

e. the initial calculation of the Handback Reserve Amount;

f. the Second Handback Inspection Report;

g. the second calculation of the Handback Reserve Amount;

h. the Third Handback Inspection Report;

i. the third calculation of the Handback Reserve Amount; and

j. the Final Handback Inspection Report.

"Handback Inspections" means inspections carried out pursuant to Sections 3.7, 3.10 and 3.12.a of Schedule 12, in accordance with the requirements of Section 3.6 of Schedule 12 (*Handback Requirements*).

"Handback Inspection Reports" means the Initial Handback Inspection Report, the Second Handback Inspection Report, the Third Handback Inspection Report, and the Final Handback Inspection Report.

"Handback Letter of Credit" has the meaning given to it in Section 4.5.a of Schedule 12 (*Handback Requirements*).

"Handback Period" means the period beginning on the date which is 34 months before the Expiry Date.

"Handback Renewal Elements Amount" has the meaning given to it in Section 4.3.a of Schedule 12 (*Handback Requirements*).

"Handback Requirements" means the requirements set out in Section 1 of Schedule 12 (*Handback Requirements*).

"Handback Reserve Account" has the meaning given to it in Section 4.1 of Schedule 12 (*Handback Requirements*).

"Handback Reserve Amount" means the sum of:

a. the Handback Renewal Elements Amount;

b. the Handback Residual Elements Amount; and

c. the estimated costs of performing any other Handback Work necessary to meet the Handback Requirements,

in each case as determined in accordance with Sections 4.2 and 4.3 of Schedule 12 (*Handback Requirements*).

"Handback Reserve Proceeds" means the aggregate of:

a. all amounts paid to the Enterprises from the Handback Reserve Account pursuant to Sections 4.4.d. and 4.4.e. of Schedule 12 (*Handback Requirements*); *plus*

b. all amounts drawn by the Enterprises on any Handback Letter of Credit pursuant to Section 4.5.b. of Schedule 12 (*Handback Requirements*),

in the case of each of paragraphs a. and b., on or following the occurrence of the Termination Date.

"Handback Reserve Standstill Period" means the period on and from the date on which Developer is first required to fund the Handback Reserve Account pursuant to Section 4.2.b of Schedule 12 (*Handback Requirements*) to the earlier of:

a. the date two Calendar Years prior to the Expiry Date; and

b. the date on which no TIFIA Loan is outstanding.

"Handback Residual Elements Amount" has the meaning given to it in Section 4.3.b of Schedule 12 (*Handback Requirements*).

"Handback Schedule " means the schedule prepared by Developer in accordance with Section 3.2 of Schedule 12 (*Handback Requirements*).

"Handback Work"	has the meaning given to it in Section 3.7.a. of Schedule 12 (*Handback Requirements*).
"Handback Work Period"	means the period beginning on the date which is 58 months before the Expiry Date.
"Handback Work Schedule "	has the meaning given to it in Section 3.8.b.v. of Schedule 12 (*Handback Requirements*).
"Hazardous Substances"	means any of the following: a. any substance, product, waste or other material of any nature whatsoever which is or becomes listed, regulated, or addressed pursuant to Environmental Law; b. any substance, product, waste or other material of any nature whatsoever that exceeds maximum allowable concentrations for elemental metals, organic compounds or inorganic compounds for the protection of human health and safety and/or the Environment, as defined by any Environmental Law; c. any substance, product, waste or other material of any nature whatsoever which may give rise to liability pursuant to Environmental Law, as defined by any Environmental Law, or under any statutory or common law theory based on negligence, trespass, intentional tort, nuisance or strict liability or under any reported decisions of a State or Federal court; d. petroleum or crude oil excluding *de minimis* amounts and excluding petroleum and petroleum products contained within regularly operated motor vehicles; e. lead or lead-containing materials; and f. asbestos or asbestos-containing materials.
"High Occupancy Vehicle"	means a vehicle occupied by more than two persons.
"Holiday"	means any Calendar Day that is declared or considered to be a holiday pursuant to C.R.S. §§ 24-11-101(1)-(2).
"HPTE"	has the meaning given to it in the Preamble.
"IAA"	means the intra-agency agreement among the Enterprises and CDOT dated as of August 22, 2017, as subsequently amended by the first amendment thereto dated on or about the Agreement Date.
"I-70 Cover Plans" or "Cover Plans"	means the plans for the Cover included in Schedule 10B (*Contract Drawings*).
"I-70 East EIS"	means all versions of the NEPA documentation for the Project, including all draft and supplemental draft environmental impact statements, the FEIS and the ROD.
"I-70 Mainline"	means Interstate 70, including the Tolled Express Lanes, General Purpose Lanes, auxiliary lanes, buffers, enforcement areas, shoulders, hard capped surface, ramps up to the intersecting cross-roadway (including directional island and free-flow turn lane where present) and associated collector-distributor roads.

"Improvement" means any building or structure, including any sewer or septic system, storm drain, publicly owned treatment work or waste treatment, storage or disposal system.

"Incident" means any event that impedes the normal flow of traffic.

"Incident Response Plan" has the meaning given to it in Section 9.4 of Schedule 11 (*Operations and Maintenance Requirements*).

"Incidental Utility Work" has the meaning given to it in the applicable URA.

"Increased Oversight Threshold" means the occurrence of any of the following:

a. during the Construction Period, the cumulative number of Noncompliance Points accrued during:

   i. any rolling 12 month period equals or exceeds 90; or

   ii. any rolling 36 month period equals or exceeds 180; or

b. during the Operating Period, the cumulative number of Noncompliance Points accrued during:

   i. any rolling 12 month period equals or exceeds 120; or

   ii. any rolling 36 month period equals or exceeds 240;

provided that, for certainty, any Noncompliance Point that is being disputed in good faith by Developer shall be disregarded for purposes of determining whether the Increased Oversight Threshold has been met or exceeded until such time as it has been Agreed or Determined that the relevant Noncompliance Point was validly assigned.

"Indemnified Party" has the meaning given to it in Section 24.2.

"Independent Assurance" means the reviews and tests described in Schedule 8 (*Project Administration*).

"Independent Market Value Appraiser" means an independent third party expert appraiser that is nationally recognized for the conduct of valuation exercises as such appraiser is jointly appointed by the Parties, provided that, if the Parties fail to agree on the identity of such appraiser or otherwise fail to complete such appointment within 15 Working Days following any relevant Termination Date, either Party may request that the Commercial Panel select and appoint such appraiser within 15 Working Days of such Party's request.

"Independent Quality Control" means all those planned and systematic actions necessary for Developer to certify to the Department that all Work fully complies with the requirements of this Agreement and that all materials incorporated in the Work, all equipment used, and all elements of the Work will perform satisfactorily for the purpose(s) intended.

"indexed" has the meaning given to it in Section 2.3.2.

"Indirect Equity Member" means each of:

a. Meridiam Infrastructure North America Fund II in its capacity as a holder of an indirect equity interest in Developer and any intermediate Person (other than an Equity Member) through which it holds such indirect equity interest in

Developer; and

b. Kiewit Development Company in its capacity as a holder of an indirect equity interest in Developer and any intermediate Person (other than an Equity Member) through which it holds such indirect equity interest in Developer,

and each of their permitted successors, assigns and transferees as holders of an indirect equity interest in Developer.

"Information" has the meaning given to it in Section 2.2.3.c.

"Initial Handback Inspection Report" means the report prepared by Developer in accordance with Section 3.8 of Schedule 12 (*Handback Requirements*).

"Initial Warning Notice" has the meaning given to it in Section 22.2.1.

"Initial O&M Contract Expiration Date" has the meaning given to it in Section 17.1.2.e.

"Insolvency Event" means, in respect of any Person,

a. any of:

i. the commencement of a voluntary case under Federal bankruptcy law;

ii. the filing of a petition seeking to take advantage of any other law, domestic or foreign, relating to bankruptcy, insolvency, reorganization, winding up or composition for adjustment of debts;

iii. the application for or the consent to the appointment of, or the taking of possession by, a receiver, custodian, trustee, or liquidator of itself or of a substantial part of its property, domestic or foreign;

iv. the admission in writing of its inability to pay its debts as they become due;

v. the making of a general assignment for the benefit of creditors; or

vi. the taking of any corporate (or equivalent) action for the purpose of authorizing any of the foregoing; or

b. the commencement of a case or other proceeding against such Person in any court of competent jurisdiction seeking:

i. relief under Federal bankruptcy law or under any other law, domestic or foreign, relating to bankruptcy, insolvency, reorganization, winding up or adjustment of debts; or

ii. the appointment of a trustee, receiver, custodian, liquidator or the like for such Person or for all or any substantial part of their respective assets, domestic or foreign,

and:

A. the petition that commenced such case or proceeding is not contested by such Person within the amount of time provided under

Law; or

B. either: (I) such case or proceeding continues without dismissal or stay for a period of 60 Calendar Days; or (II) an order granting the relief requested in such case or proceeding (including, but not limited to, an order for relief under such Federal bankruptcy law) is entered and not appealed to the extent that the order for relief is stayed.

"Insolvent" means the condition of a Person in respect of whom an Insolvency Event has occurred.

"Inspection" means the organized examination or formal evaluation of Work, including manufacturing, design, and maintenance practices, processes, and products, document control and shop drawing review, to ensure that the practices, processes, and products comply with the quality requirements contained in this Agreement.

"Inspecting Parties" has the meaning given to it in Section 19.1.3.a and "Inspecting Party" means any one of them.

"Insurance Broker" means Developer's insurance broker, provided that such broker shall at all times be a reputable international insurance broker of good standing.

"Insurance Cost Decrease" means, if (a) the Actual Benchmarked Insurance Cost minus the Project Insurance Change (which, for certainty, can be less than $0) is less than (b) the Proposal Benchmarked Insurance Cost, subject to the procedure set out in Section 25.7, the amount determined as follows:

"Insurance Cost Decrease" = (PBIC - ABIC) - (PIC),

where:

"PBIC" is the Proposal Benchmarked Insurance Cost;

"ABIC" is the Actual Benchmarked Insurance Cost; and

"PIC" is any Project Insurance Change (which, for certainty, can be less than $0).

"Insurance Cost Increase" means, if (a) the Actual Benchmarked Insurance Cost minus the Project Insurance Change (which, for certainty, can be less than $0) is greater than (b) the Base Benchmarked Insurance Cost, subject to the procedure set out in Section 25.7, the amount determined as follows:

"Insurance Cost Increase" = (ABIC - BBIC) - (PIC),

where:

"ABIC" is the Actual Benchmarked Insurance Cost;

"BBIC" is the Base Benchmarked Insurance Cost; and

"PIC" is any Project Insurance Change (which, for certainty, can be less than $0).

"Insurance Policies" has the meaning given to it in Section 25.1.1.

"Insurance Renewal Date" means the first anniversary of the Benchmarked Insurance Inception Date and, thereafter, each date falling on the anniversary of the prior Insurance Renewal Date.

"Insurance Review Period" means:

a. the two year period commencing on the Benchmarked Insurance Inception Date and ending on the Calendar Day immediately prior to the second Insurance Renewal Date; and

b. each subsequent two year period commencing on each even-numbered anniversary of the Benchmarked Insurance Inception Date and ending on the Calendar Day immediately prior to the second anniversary of the first day of such two year period,

in the case of either paragraphs a. or b., except where the end of such period lies beyond the last Calendar Day of the Term, in which case the relevant Insurance Review Period shall end on the last Calendar Day of the Term.

"Insurance Term" means a provision that must be included in one or more of the Insurance Policies in order for Developer to comply with Section 25.1.1.

"Intellectual Property" means all current and future legal and/or equitable rights and interests in or to know-how, patents (including applications), copyrights (including moral rights), trademarks (registered and unregistered), service marks, trade secrets, designs (registered and unregistered), utility models, circuit layouts, business and internet domain names, inventions, solutions embodied in technology and other intellectual activity and applications of or for any of the foregoing subsisting in or relating to the Project or Project design data including:

a. algorithms, software, source code and source code documentation used in connection with the Project; and

b. the Financial Model (including (i) formulas and (ii) data (such data including all back-up information in any media or format (digital or otherwise) regarding the basis for Developer's assumptions, estimates, projections and calculations contained in or derived from the Financial Model)).

"Intellectual Property Escrow" has the meaning given to it in Section 52.3.2.

"Intellectual Property Escrow Agent" has the meaning given to it in Section 52.3.2.

"Intelligent Transportation Systems" or "ITS" means the information and communication technologies used to inform roadway users, collect data and collect tolls.

"Interior Zone" means the length of roadway between the Transition Zone and the Exit Zone and which has constant illumination.

"Internal Revenue Code" means the Internal Revenue Code of 1986, and the Regulations promulgated by the U.S. Department of Treasury.

"ITP" has the meaning given to it in the Recitals.

"Joint Insurance Cost Report" has the meaning given to it in Section 25.7.2.

"Key Financial Event" means any of the following:

a. the Preferred Proposer:

i. assumed a TIFIA Financing in its Base Financial Model and a TIFIA Event occurs; and/or

ii. assumed a Bond Financing using PABs in its Base Financial Model and a PABs Event occurs; or

b. on any Calendar Day in any applicable Protection Period the cumulative effect of fluctuations in applicable Benchmark Interest Rates, together with any changes in credit spreads applicable to a Bond Financing (excluding any private placement that is not also an offering under Rule 144A and Regulation S of the Securities Act of 1933), during the applicable Protection Period would result in an increase to the Base CPP in an amount that would result in an upward adjustment to the Base MPP of more than 10% as determined pursuant to Annex A to Schedule 1 (*Financial Close*) assuming, for such purposes, that such adjustment were to be made on such day;

c. the Enterprises conclude, in their reasonable opinion, that either of the foregoing events referred to in paragraphs a. or b. of this definition is likely to occur and, in the case of paragraph b., is likely to occur on the Financial Close Date;

d. the issuance of any temporary restraining order, preliminary or permanent injunction or other form of interlocutory relief by a court of competent jurisdiction that prohibits the prosecution of a material part of the Work, which order, injunction or other relief remains in effect on the Financial Close Deadline;

e. the Enterprises, in their reasonable discretion, notify Developer that there is an unacceptable risk that any lawsuit filed in a court of competent jurisdiction could result in a Termination by Court Ruling; or

f. if any prospective Lender (including, for certainty, any underwriter) reasonably invokes a condition in its "Debt Commitment Letter" (as defined in the ITP) provided with the Preferred Proposer's Proposal that, as of the Financial Close Date, there be an absence of:

i. any Material Litigation filed after the Financial Proposal Deadline; or

ii. any new orders, rulings or other actions by the court presiding over any Material Litigation filed on or prior to the Financial Proposal Deadline that would, as reasonably determined by the prospective Lenders (including, for certainty, any underwriters), materially increase the likelihood that such Material Litigation could result in a Termination by Court Ruling,

by giving written notice thereof to Developer (with a copy to the Enterprises) at least 30 Calendar Days prior to the Financial Close Deadline (or, with respect to any new order, ruling or other action which occurs within 30 Calendar Days of the Financial Close Deadline, promptly after the occurrence of such event),

in each case unless and to the extent such event arises as a result of any breach of Law, Governmental Approval, Permit or this Agreement, or fraud, willful misconduct, criminal conduct, recklessness, bad faith or negligence by or of any Developer-Related Entity.

"Key Milestone" means each of the dates for issuance of NTP1 and NTP2, the Snow and Ice Control Commencement Date, each of the Milestone Completion Target Dates, the Baseline Substantial Completion Date, the Final Acceptance Date and each of the dates for submission of Deliverables by Developer as specified in the DRTL.

"Key Personnel" means the individuals identified in Schedule 27 (*Key Personnel*) to fill the various job positions set out in that Schedule, and any replacement personnel Accepted pursuant to Section 16.1.

"Key Ratios" means:

a. the Total Debt Service Coverage Ratio ((i) prior to Financial Close, as such term is defined in the Baseline TIFIA Term Sheet and (ii) following Financial Close, as such term is defined in the TIFIA Loan Agreement), or any equivalent ratio calculated with respect to Project Debt that is not comprised of a TIFIA Loan; and

b. at any time that a TIFIA Loan is outstanding, the Project Life Coverage Ratio ((i) prior to Financial Close, as such term is defined in the Baseline TIFIA Term Sheet and (ii) following Financial Close, as such term is defined in the TIFIA Loan Agreement).

"Known or Knowable" means any risk, information, matter or thing that on or prior to the Setting Date:

a. was identified, described or expressly anticipated in the Project Information or the I-70 East EIS, or in any Department Provided Approval;

b. was otherwise disclosed to or known by the Preferred Proposer or a Developer-Related Entity; or

c. could reasonably have been known, identified, discovered, observed or anticipated by the Preferred Proposer (and, to the extent in existence at such time, Developer) undertaking due diligence pursuant to Good Industry Practice, and taking into account (without limitation):

i. the provisions of the ITP with respect to the conduct of due diligence;

ii. the Enterprises' approval of and response to Proposers' diligence-related requests and comments submitted pursuant to the ITP to the

extent such diligence-related request or comment was:

A. submitted by the Preferred Proposer; or

B. submitted by other Proposers and made available to the Preferred Proposer prior to the Setting Date;

iii. the availability and contents of all Project Information, Department Provided Approvals, the I-70 East EIS and all other available Environmental Approvals, Governmental Approvals, and all other requirements, manuals, guidance, reports and other information referenced by:

A. any of the Environmental Requirements;

B. the Phase I environmental site assessments included in the Reference Documents; or

C. this Agreement; and

iv. the opportunity to review all Law.

"Laboratory" means the testing laboratory of Developer, CDOT or any other certified testing laboratory.

"Law" means:

a. any:

i. statute, law (including common law), code, regulation, ordinance or rule;

ii. binding judgment, judicial or administrative order or decree (other than one rendered pursuant to the Dispute Resolution Procedure);

iii. written directive, guideline, policy requirement, methodology or other governmental restriction or requirement (including those resulting from an initiative or referendum process, but excluding those by the Enterprises within the scope of their administration of this Agreement); and

iv. similar form of decision of or determination by, or any written interpretation or administration of any of the foregoing by, any Governmental Authority,

in each case that is applicable to or has an impact on the Project or the Work (where such applicability or impact shall be determined by reference to the context in which the term Law is used), whether taking effect before or after the Agreement Date, including Environmental Laws, but excluding Governmental Approvals and Permits; and

b. any Public Safety Order.

"Lender" means any Person that provides or holds and is owed repayment of Project Debt, together with their respective successors, assigns, participating parties, trustees and agents, including any Collateral Agent.

"Lenders Direct Agreement" means the agreement in substantially the form attached in Schedule 19 (*Forms of Direct Agreements*) by and among the Enterprises, Developer, and the Lender (or if there is more than one Lender, the Collateral Agent on behalf of the Lenders).

"Lenders' Liabilities" means, as of the Termination Date, the aggregate of (without double-counting):

a. all:

i. principal;

ii. capitalized interest, accrued interest and default interest (but, with respect to default interest, only to the extent that it arose as a result of the Enterprises making any payment later than the date that it was due under this Agreement);

iii. customary and reasonable lender, agent and trustee fees, costs and expenses; and

iv. lease financing obligations,

owing or outstanding to the Lenders by Developer under or pursuant to the Financing Documents on the Termination Date; *plus*

b. any Breakage Costs payable by Developer that arise as a result of the early termination of this Agreement on the Termination Date; *minus*

c. any Breakage Costs payable or credited to Developer that arise as a result of the early termination of this Agreement on the Termination Date,

provided that, with respect to the period from the Termination Date to and including the date of payment by the Enterprises of the undisputed portion of the Termination Amount:

d. any net payments or net receipts under any interest rate or inflation rate hedging agreement or other derivative facility that is in effect on the Termination Date but not terminated until such date of payment; and

e. other than with respect to any termination as a consequence of a Developer Default, any amount of interest that falls within paragraph a.ii. of this definition, that will accrue during such period,

shall also be taken into account in the calculation of the Lenders' Liabilities.

"Level of Service" means, in relation to the O&M Work, the level of service as described in CDOT's Maintenance Level of Service Manual.

"Limited O&M Work" means any and all operations, management, administration, maintenance and Routine Maintenance activities, in each case required to be carried out by Developer to:

a. comply with all the requirements set out in Schedule 11 (*Operations and Maintenance Requirements*) (including, for certainty, the requirements set out in Appendix A-1 and Appendix A-2 thereto) associated with:

i. Snow and Ice Control Services;

ii. performance of the courtesy patrol service pursuant to Section 10 of, and Appendix B to, Schedule 11 (*Operations and Maintenance Requirements*);

iii. sweeping and cleaning (including complying with Section 1.1 and Section 17 of each of Appendix A-1 and Appendix A-2 of Schedule 11 (*Operations and Maintenance Requirements*));

iv. Incident response;

v. its obligations with respect to ITS and ETC facilities as set out in Sections 2.2.6.b and 3.2.8.d. of Schedule 11 (*Operations and Maintenance Requirements*); and

vi. its obligations with respect to lighting as set out in Sections 2.2.8 and 3.2.11.b. of Schedule 11 (*Operations and Maintenance Requirements*), other than graffiti removal on lighting;

b. comply with any other provisions of this Agreement applicable to the performance of all activities that fall within paragraph a. of this definition; and

c. without prejudice to any of its other notification or reporting obligations under this Agreement (including under Schedule 6 (*Performance Mechanism*) or Schedule 11 (*Operations and Maintenance Requirements*)), provide the Department with notification of O&M Defects (assuming for the purposes of this paragraph c. that the definition of O&M Defects in this Part A of Annex A (*Definitions and Abbreviations*) applies to all Elements within or forming part of the Limited O&M Work Segments, regardless of whether the Developer is required to perform Limited O&M Work thereon or not) within the Limited O&M Work Segments as observed by Developer while performing any activity that falls within paragraph a. or b. of this definition,

during the Construction Period or the Operating Period, as applicable.

"Limited O&M Work Segments" means:

a. the segment of the I-70 Mainline from the I-25/I-70 interchange to I-70 Brighton Boulevard interchange (including its associated infrastructure (including all roadway lanes, ramps, shoulders, and structures));

b. the segment of the I-70 Mainline from I-70 Chambers Road interchange to I-70 Tower Road interchange (including its associated infrastructure (including all roadway lanes, ramps, shoulders, and structures)); and

c. the structure, with number E-17-AED, on the I-70

westbound entrance ramp from Central Park Boulevard,

in the case of each of paragraphs a. to c. of this definition, to the extent within the O&M Limits.

"Local Agency" means any local Governmental Authority other than the State or an agency thereof.

"Local Agency Roadway" means roadways (whether owned by a Local Agency or CDOT) excluding CDOT Roadways and the I-70 Mainline.

"Local Hiring Goal" has the meaning given to it in Section 6.3.1.b of Schedule 15 (*Federal and State Requirements*).

"Long Term Project Debt" means the aggregate amount of Project Debt that by its terms or pursuant to the Financial Model:

a. is scheduled to remain outstanding after the Substantial Completion Date; and

b. not scheduled to be repaid with a Milestone Payment (including the Substantial Completion Payment).

"Longstop Date" means the date that occurs 585 Calendar Days after the Baseline Substantial Completion Date (for certainty, as the Baseline Substantial Completion Date may be extended from time to time), as such Longstop Date may be extended from time to time pursuant to:

a. Section 15.3.1.c.iii, as a result of the occurrence of a Supervening Event; or

b. a Change documented in a Change Order.

"Loss" or "Losses" means any loss, damage, cost, expense, charge, fee, injury, liability, obligation, judgment, penalty or fine, in each case including attorneys', accountants' and expert witnesses' fees and expenses (including those incurred in connection with the enforcement of any indemnity or other provision of this Agreement).

"Lowered Section" means the segment of the I-70 Mainline between Brighton Boulevard and Dahlia Street where the proposed vertical profile is modified below existing ground.

"Maintenance Management Information System" means the system required to be established and maintained by Developer in accordance with of Section 7 of Schedule 11 (*Operations and Maintenance Requirements*).

"Maintenance Management Plan" or "MMP" means the plan referred to in Section 5 of Schedule 11 (*Operations and Maintenance Requirements*) that sets out how Developer will comply with its maintenance obligations under this Agreement (as updated in accordance with Schedule 11 (*Operations and Maintenance Requirements*)).

"Maintenance Rectification Costs" means:

a. all Losses that the Enterprises determine they and/or CDOT are reasonably likely to incur as a direct result of the termination of this Agreement after the Substantial Completion Date, including (without double-counting):

i. those costs (internal and external) that the Enterprises reasonably and properly project that they (and/or CDOT) will incur in carrying out any process to request bids from any parties interested

in entering into one or more contracts with the Enterprises (and/or CDOT) to conduct all remaining Work, including all costs related to the preparation of bid documentation, evaluation of bids and negotiation and execution of relevant contracts; plus

ii. those costs (internal and external) that the Enterprises reasonably and properly project that they (and/or CDOT) will incur in relation to:

A. remediation or, if remediation is not possible or would cost more than renewal, renewal of any Nonconforming Work performed by Developer; and

B. rectification or cure of any breach of this Agreement by Developer; *plus*

iii. those costs (internal and external) that the Enterprises reasonably and properly project they (and/or CDOT) will incur through the remainder of the Term in order to perform the Work in accordance with the terms of this Agreement, but only to the extent such projected costs exceed the costs assumed in the Financial Model if the Work had been performed by Developer; *minus*

b. any Handback Reserve Proceeds; *minus*

c. any amounts standing to the credit of the Physical Damage Proceeds Reserve that the Enterprises are entitled to retain pursuant to Section 25.5.2.d.

"Maintenance Yard" means the maintenance yard located within the southeast quadrant of the interchange at Havana Street and within the Existing CDOT Right-of-Way.

"Managed Lanes" has the same meaning as Tolled Express Lanes.

"Master Indenture" means the Master Trust Indenture, dated as of December 15, 2010, between BE and the BE Trustee.

"Material Litigation" means any lawsuit filed in a court of competent jurisdiction that:

a. seeks to overturn, set aside, enjoin, or otherwise inhibit the implementation of any Department Provided Approval based on alleged non-compliance with Law, including NEPA; or

b. could result in a Termination by Court Ruling.

"Materials Management Plan" means the "MMP" prepared by Developer in accordance with Section 23.8 of Schedule 17 (Env*ironmental Requirements*).

"Measurement Criteria" means, in respect of an Element, the measurement criteria applicable to such Element specified in the "Measurement Criteria" column in the Performance and Measurement Tables (as updated in accordance with Schedule 11 (*Operations and Maintenance Requirements*)).

"Microwave Vehicle Radar Detection" means a side fire radar used to collect point data of volume, occupancy, speed and classification on each lane of travel.

"Mile High Courtesy Patrol" is the courtesy patrol program operated by CDOT.

"Milestone 1" means the Construction Work between Sand Creek Bridge and Chambers Road (Station 2192+00 to 2448+00) comprising the addition of one Tolled Express Lane in each direction within the limits.

"Milestone 2" means the Construction Work between Dahlia Street and Sand Creek Bridge (Station 2091+00 to 2192+00) comprising the addition of one Tolled Express Lane in each direction within the limits.

"Milestone 3" means the Construction Work between Brighton Blvd and Dahlia Street (Station 2000+00 to 2091+00) comprising westbound I-70 and 46th Avenue/Stapleton Drive (north of I-70), and the UPRR Crossing.

"Milestone 4" means the Construction Work between Brighton Blvd and Dahlia Street (Station 2000+00 to 2091+00) comprising eastbound I-70 and 46th Avenue/Stapleton Drive (south of I-70).

"Milestone Completion" means the satisfaction of all Milestone Completion Conditions, as confirmed by the Enterprises' issuance of the Milestone Completion Certificate.

"Milestone Completion Certificate" has the meaning given to it in Section 5(a) of Part 4 of Schedule 3 (*Commencement and Completion Mechanics*).

"Milestone Completion Conditions" has the meaning given to it in Section 1 of Part 4 of Schedule 3 (*Commencement and Completion Mechanics*).

"Milestone Completion Date" has the meaning given to it in Section 5(a) of Part 4 of Schedule 3 (*Commencement and Completion Mechanics*).

"Milestone Completion Punch List" has the meaning given to it in Section 2(a) of Part 7 of Schedule 3 (*Commencement and Completion Mechanics*).

"Milestone Completion Punch List Items" has the meaning given to it in Section 2(a) of Part 7 of Schedule 3 (*Commencement and Completion Mechanics*).

"Milestone Completion Target Date" means each of:

a. for Milestone 1, November 18, 2019;

b. for Milestone 2, October 20, 2020;

c. for Milestone 3, September 26, 2020; and

d. for Milestone 4, September 5, 2021,

as each such date shall be modified on a day for day basis to reflect any delay in achieving Financial Close relative to November 30, 2017 (the date assumed in the ITP), as such modification shall be formalized pursuant to the Project Agreement Amendment in accordance with paragraph d. of the definition thereof in this Part A of Annex A (*Definitions and Abbreviations*).

"Milestone Delay Period" has the meaning given to it in Section 15.3.1.c.ii.

"Milestone Payment" has the meaning given to it in Section 1 of Schedule 5 (*Milestone Payments*).

"Milestone Payment Delay Costs" means, in respect of any Milestone Delay Period, the aggregate of:

a. all amounts (excluding default interest) of interest, together with any commitment or standby fees on undrawn loan facilities, that will accrue under the Financing Documents during such Milestone Delay Period; and

b. only if Section 33.1.6.c.i.C.I applies, all amounts of principal that will fall due for payment from the date on which

termination of this Agreement would have otherwise been effective,

in each case with respect to the Project Debt scheduled (as determined by reference to the Financial Model) to have been repaid by the Milestone Payment (or a portion thereof) (including, for certainty, the Substantial Completion Payment) following Milestone Completion of the relevant Payment Milestone or, as applicable, Substantial Completion.

"Milestone Payment Request Due Date"	has the meaning given to it in Section 2 of Schedule 5 (*Milestone Payments*).
"Milestone Payment Request"	has the meaning given to it in Section 2 of Schedule 5 (*Milestone Payments*).
"month"	means a month as determined by reference to the time and date in Denver, Colorado.
"Monthly Construction Closure Deduction"	means, for any month, an amount equal to the sum of the Construction Closure Deductions that accrued during such month, calculated in accordance with Section 3 of Part 1 of Schedule 6 (*Performance Mechanism*).
"Monthly Deductions Report"	means a report submitted by Developer to the Enterprises pursuant to Section 2.1 of Part 1 of Schedule 4 (*Payments*), Section 3.1 of Part 2 of Schedule 4 (*Payments*) or Section 4(b)(ii) of Schedule 5 (*Milestone Payments*).
"Monthly Noncompliance Deduction"	means, for any month, an amount equal to the sum of the deductions that accrued during such month in respect of Noncompliance Events, calculated in accordance with, as applicable, Section 2 of Part 1 of Schedule 6 (*Performance Mechanism*) or Section 2 of Part 3 of Schedule 6 (*Performance Mechanism*).
"Monthly O&M Report"	has the meaning given to it in Section 13.1 of Schedule 11 (*Operations and Maintenance Requirements*).
"Monthly Operating Period Closure Deduction"	means, for any month, an amount equal to the sum of the Operating Period Closure Deductions that accrued during such month, calculated in accordance with Section 3 of Part 3 of Schedule 6 (*Performance Mechanism*).
"Monthly Performance Deduction"	means, for any month, an amount equal to the aggregate of the Monthly Noncompliance Deduction and the Monthly Operating Period Closure Deduction, in each case, for such month.
"Monthly Progress Schedule "	means the monthly updated program schedule submitted pursuant to Section 3.3.5 of Schedule 8 (*Project Administration*).
"MOT Task Force"	means a team established by Developer pursuant to Section 2.2.6 of Schedule 10 (*Design and Construction Requirements*) to assume proper coordination with Governmental Authorities affected by the Work, in relation to maintenance of traffic.
"MOT Variance"	means a variance to the requirements applicable to Closures, detours and any other restrictions set out in Section 2 (*Maintenance of Traffic*) of Schedule 10, as Approved by the Department or approved by the relevant Local Agency, as applicable, in accordance with Section 2.3 of Schedule 10 (*Design and Construction Requirements)*.

"NEPA" has the meaning given to it in the Recitals.

"New Environmental Approvals" means any of the following:

a. a new Environmental Approval; and

b. a modification, renewal or extension of an existing Environmental Approval.

"No Better and No Worse" shall be interpreted pursuant to Section 28.2.

"No Conflict Form" means a form set out in Appendix A to Section 4 of Schedule 10.

"No-deductible Event" means any Compensation Event described in paragraphs a., b.i., b.ii., b.iii., d., e. i.i., l. or o. of the definition thereof in this Part A of Annex A (*Definitions and Abbreviations*).

"Noncompliance and Closure Database" means the database described in Section 2 of Part 6 of Schedule 6 (*Performance Mechanism*).

"Noncompliance Cure Period" means:

a. for any Noncompliance Event for which the Cure Period is specified in days, each continuous period of "x" days commencing from and including:

i. if such Noncompliance Event does not have a Grace Period, the Noncompliance Start Time of such Noncompliance Event; or

ii. if such Noncompliance Event has a Grace Period, the expiry of such Grace Period,

in the case of i. and ii., to and excluding the Noncompliance Rectification Time of such Noncompliance Event, where "x" equals the number of days specified as the Cure Period for such Noncompliance Event; and

b. for any Noncompliance Event for which the Cure Period is specified in hours or months, each continuous period of "x" hours or months, respectively, commencing from and including the Noncompliance Start Time of such Noncompliance Event to and excluding the Noncompliance Rectification Time of such Noncompliance Event, where "x" equals the number of hours or months, as applicable, specified as the Cure Period for such Noncompliance Event,

provided that, for certainty, the Noncompliance Cure Period during which the Noncompliance Rectification Time occurs in respect of the relevant Noncompliance Event will have a duration of less than "x" days, hours or months, as applicable, and any reference in Schedule 6 (*Performance Mechanism*) to a "partial" Noncompliance Cure Period shall be deemed to refer to such Noncompliance Cure Period for the relevant Noncompliance Event.

"Noncompliance Default Event" means the occurrence of any of the following:

a. during the Construction Period, the cumulative number of Noncompliance Points accrued during:

i. any rolling 12 month period equals or exceeds 135; or

ii. any rolling 36 month period equals or exceeds 270;

or

b. during the Operating Period, the cumulative number of Noncompliance Points accrued during:

i. any rolling 12 month period equals or exceeds 180; or

ii. any rolling 36 month period equals or exceeds 360;

provided that, for certainty, any Noncompliance Point that is being disputed in good faith by Developer shall be disregarded for purposes of determining whether the Noncompliance Default Event has occurred until such time as it has been Agreed or Determined that the relevant Noncompliance Point was validly assigned.

"Noncompliance Event" means any failure:

a. set out in Table 6A.1 which occurs during the Construction Period; and

b. set out in Table 6A.2 which occurs during the Operating Period.

"Noncompliance Points" means the points accrued by Developer in respect of the occurrence of Noncompliance Events in accordance with Part 4 of Schedule 6 (*Performance Mechanism*).

"Noncompliance Rectification Time" means, in respect of any Noncompliance Event which has a Cure Period, the date and time that the Noncompliance Event is fully cured.

"Noncompliance Start Time" means, for any Noncompliance Event, whether or not such Noncompliance Event has a Cure Period, the date and time that the Noncompliance Event occurs, provided that, for certainty, for any Noncompliance Event that is a failure to remedy a Category 1 Defect or a Category 2 Defect within the Defect Remedy Period, the Noncompliance Start Time shall be the date and time that the applicable Defect Remedy Period expires.

"Nonconforming Work" means Work performed by Developer that does not meet the requirements of this Agreement.

"Nonconforming Work Change" has the meaning given to it in Section 2.1.b.ii of Schedule 24 (*Change Procedure*).

"Nonconforming Work Remedy" means action taken by Developer to ensure that any Nonconforming Work meets the requirements of this Agreement.

"Non-Appendix B Parcel Unexpected Hazardous Substances Event" the encountering or discovery of collectively all Unexpected Hazardous Substances on, in or under:

a. an individual ROW Parcel that is not an Appendix B Parcel; or

b. a Permit Area (excluding any Developer-risk Permit Area).

"Non-Permitted Closures" means:

a. during the Construction Period, any Non-Permitted Construction Closure; or

b. during the Operating Period, any Non-Permitted Operating Period Closure.

"Non-Permitted means any Closure that occurs during the Construction Period:

Construction Closure"

a. that:

i. results in any breach of, or is not permitted by, any of Sections 2.5.3, 2.6, 2.7, 2.9, 2.11.5, 2.11.6, 2.11.7.a, 2.11.9, 2.11.10, 2.11.11, 2.11.12 or 2.11.19 of Schedule 10 (*Design and Construction Requirements*), unless such Closure has been Approved by the Department or approved by the relevant Local Agency, as applicable, as a MOT Variance; and

ii. is not an Excused Closure; or

b. is deemed to be a Non-Permitted Construction Closure pursuant to Section 2.11.14.c of Schedule 10 (*Design and Construction Requirements*),

provided that, if any Closure that occurs during the Construction Period is not a Non-Permitted Construction Closure when it starts, but during such Closure circumstances commence to apply that would have resulted in such Closure being a Non-Permitted Construction Closure if such circumstances had applied to such Closure when it started, then the portion of such Closure that continues while such circumstances apply shall be deemed to be a Non-Permitted Construction Closure (and such deemed Non-Permitted Construction Closure shall be deemed to start when such circumstances commence to apply and to end when they cease to apply).

"Non-Permitted Operating Period Closure" means a Closure that occurs during the Operating Period in an O&M Segment:

a. that:

i. is not a Permitted Operating Period Closure; and

ii. is not an Excused Closure; or

b. is deemed to be a Non-Permitted Operating Period Closure pursuant to Section 2.11.14.d of Schedule 10 (*Design and Construction Requirements*),

provided that, if any Closure that occurs during the Operating Period is not a Non-Permitted Operating Period Closure when it starts, but during such Closure circumstances commence to apply that would have resulted in such Closure being a Non-Permitted Operating Period Closure if such circumstances had applied to such Closure when it started, then the portion of such Closure that continues while such circumstances apply shall be deemed to be a Non-Permitted Operating Period Closure (and such deemed Non-Permitted Operating Period Closure shall be deemed to start when such circumstances commence to apply and to end when they cease to apply).

"notice" (or "Notice") has the meaning given to it in Section 49.1.1.

"Notice of Award" means the notice issued on August 24, 2017 by the Enterprises notifying the Preferred Proposer of its selection as the Preferred Proposer.

"Notice of Possession" means a notice delivered by the Enterprises to Developer specifying the Calendar Day (the "Possession Date") on which the Enterprises shall deliver to Developer Possession of one or more ROW Parcels or Additional ROW Parcels identified in such notice.

"Notifiable Refinancing" means any Refinancing that is not a Qualifying Refinancing.

"NTP1" has the meaning given to it in Section 4 of Part 1 of Schedule 3 (*Commencement and Completion Mechanics*).

"NTP1 Conditions" has the meaning given to it in Section 1 of Part 1 of Schedule 3 (*Commencement and Completion Mechanics*).

"NTP1 Work" means:

a. the design Work;

b. preparatory testing and Right-of-Way investigation Work that is authorized by CDOT right of entry permits obtained by Developer pursuant to Section 1.2 of Schedule 18 (*Right-of-Way*) prior to the issuance of NTP1; and

c. preparatory Work necessary to develop the Deliverables required to be submitted by Developer to satisfy the NTP1 Conditions.

"NTP2" means the notice that constitutes "NTP2" in accordance with Sections 4(a) and 5 of Part 2 of Schedule 3 (*Commencement and Completion Mechanics*).

"NTP2 Conditions" has the meaning given to it in Section 1 of Part 2 of Schedule 3 (*Commencement and Completion Mechanics*).

"NTP3" has the meaning given to it in Section 3 of Part 3 of Schedule 3 (*Commencement and Completion Mechanics*).

"NTP3 Conditions" has the meaning given to it in Section 1 of Part 3 of Schedule 3 (*Commencement and Completion Mechanics*).

"Offsite Outfall System" means the drainage system to be constructed pursuant to Section 8.4.9.a of Schedule 10 (*Design and Construction Requirements*) conveying flows generated from outside the Site and capturing the flow preventing it from draining into the Lowered Section, that will be located to the south of I-70 Mainline and consists of ponds and large Storm Drains, routed through Globeville Park and with a discharge into the South Platte River.

"Onsite Outfall System" means the drainage system to be constructed pursuant to Section 8.4.9.b of Schedule 10 (*Design and Construction Requirements*) conveying flows generated from the onsite roadway area located within the Lowered Section to the north, with a discharge into the South Platte River.

"O&M Contract" means the contract for the performance of the O&M Work excluding the O&M Work During Construction entered into between Developer and the O&M Contractor in compliance with Section 17, provided that, if and to the extent of any self-performance of the O&M Work by Developer, references to such term shall be construed either as references to this Agreement, or as inapplicable, as the context may require.

"O&M Contractor" means the Subcontractor engaged by Developer under the O&M Contract, provided that, if and to the extent of any self-performance of the O&M Work by Developer, references to such term shall be construed either as references to Developer, or as inapplicable, as the context may require.

"O&M Defect" means:

a. any Defect in an Element or any part of an Element;

b. any failure of an Element or any part of an Element to

comply with the applicable General Requirement or any other requirement set out in this Agreement, in any such case as a result of Developer's failure to perform any of its obligations under Schedule 11 (*Operations and Maintenance Requirements*); and

c. any failure of an Element or any part of an Element to meet or exceed the Target for the applicable Measurement Criteria, in any such case as a result of Developer's failure to perform any of its obligations under Schedule 11 (*Operations and Maintenance Requirements*).

"O&M Limits" means:

a. prior to (and including) the Substantial Completion Date, the O&M Limits during Construction; and

b. after the Substantial Completion Date, the O&M Limits After Construction.

"O&M Limits After Construction" means the limits specified in the drawings referred to in Section 3.1 of Schedule 11 (*Operations and Maintenance Requirements*), as Accepted by the Department (as updated in accordance with Schedule 11 (*Operations and Maintenance Requirements*)).

"O&M Limits During Construction" means the limits specified in the drawings referred to in Section 2.1 of Schedule 11 (*Operations and Maintenance Requirements*), as Accepted by the Department (as updated in accordance with Schedule 11 (*Operations and Maintenance Requirements*)).

"O&M Limits Reference Drawings" means the drawings provided as Reference Documents and listed in document number 29.11.01 of Schedule 29 (*Reference Documents*).

"O&M Period During Construction" means the period commencing on the date of issuance of NTP2 and ending on (and including) the Substantial Completion Date (or, if earlier, the Termination Date).

"O&M Quality Management Plan" means the plan described in Section 5.4 of Schedule 11 (*Operations and Maintenance Requirements*) (as updated in accordance with Schedule 11 (*Operations and Maintenance Requirements*)).

"O&M Safety Plan" means the plan described in Section 5.3 of Schedule 11 (*Operations and Maintenance Requirements*), (as updated in accordance with Schedule 11 (*Operations and Maintenance Requirements*)).

"O&M Segment" means any one of the following segments of the Project within the Site along I-70 Mainline including I-70 Mainline and associated ramps, cross streets, CDOT Roadways and Local Agency Roadways:

O&M Segment	Start	End
1	274.000 (I-25 Interchange)	276.572 (Colorado Blvd)
2	276.572 (Colorado Blvd.)	278.548 (Quebec St.)
3	278.548 (Quebec St.)	282.563 (I-225)
4	282.563 (I-225)	285.727 (Tower Road)

"O&M Standards" means:

a. any standards and specifications expressly referenced in this Agreement (including in Section 1.1.5 of Schedule 11 (*Operations and Maintenance Requirements*)) as applicable

to the O&M Work (excluding, for certainty, any Laws, Governmental Approvals or Permits); and

b. any standards and specifications that apply to the O&M Work (excluding, for certainty, any Laws, Governmental Approvals or Permits), including as a result of Developer's methods of performing the O&M Work,

in each case in the form published or otherwise in effect as of the Final Project Information Date (subject to change, addition or replacement pursuant to Section 8.6).

"O&M Work" means any and all operations, management, administration, maintenance, repair, preservation, modification, reconstruction, rehabilitation, restoration, renewal and replacement work and activities, including Routine Maintenance, Renewal Work and Work undertaken pursuant to the Handback Requirements, in each case required to be carried out by Developer to comply with all requirements set out in Schedule 11 (*Operations and Maintenance Requirements*) and any other provisions of this Agreement applicable to the performance of the O&M Work during the Construction Period or the Operating Period, as applicable, provided that, for certainty:

a. O&M Work shall only include Limited O&M Work with respect to the Limited O&M Work Segments; and

b. O&M Work shall exclude Cover Top O&M Work.

"O&M Work After Construction" means any and all O&M Work required to be performed by Developer during the Operating Period pursuant to Section 3 and other provisions of Schedule 11 (*Operations and Maintenance Requirements*).

"O&M Work During Construction" means any and all O&M Work required to be performed by Developer during the O&M Period During Construction pursuant to Section 2 and other provisions of Schedule 11 (*Operations and Maintenance Requirements*).

"OP Deduction Month" has the meaning given to it in Section 3.2 of Part 2 of Schedule 4 (*Payments*).

"Operations Goal Deduction" means the amount calculated in accordance with Section 1(d) of Part 2 of Schedule 6 (*Performance Mechanism*).

"Operating Period" means the period that begins on the Calendar Day after the Substantial Completion Date and ends on the earlier of the Expiry Date and the Termination Date.

"Operating Period Closure Deduction" means, in respect of each full or partial Closure Deduction Period that commences in respect of any Non-Permitted Operating Period Closure:

a. if such Closure Deduction Period commences on a Calendar Day that is not during a Weekend and is not a Holiday, the amount set out in the Operating Period Closure Deductions Table for the type of Closure that caused such Non-Permitted Operating Period Closure;

b. if such Closure Deduction Period commences on a Calendar Day that is during a Weekend, 50% of the amount set out in the Operating Period Closure Deductions Table for the type of Closure that caused such Non-Permitted Operating Period Closure; or

c. if such Closure Deduction Period commences on a Calendar Day that is a Holiday, 150% of the amount set out in the Operating Period Closure Deductions Table for the type of Closure that caused such Non-Permitted Operating Period Closure,

subject, in the case of paragraphs a., b. and c., to the provisions of Section 2 of Part 5 of Schedule 6 (*Performance Mechanism*).

"Operating Period Closure Deductions Table" means the table set out in Section 3.2 of Part 3 of Schedule 6 (*Performance Mechanism*) (subject to amendment pursuant to Section 3.3 of Part 3 of Schedule 6 (*Performance Mechanism*)).

"Operating Period Small Business Goals" has the meaning given to it in Section 6.2.2.a of Schedule 15 (*Federal and State Requirements*).

"Operations Management Plan (OMP)" means the plan referred to in Section 9 of Schedule 11 (*Operations and Maintenance Requirements*) that sets out how Developer will comply with its operations obligations under this Agreement (as updated in accordance with Schedule 11 (*Operations and Maintenance Requirements*)).

"Organizational Conflict of Interest" means an organizational conflict of interest as described in 2 C.C.R. 601-15 Sec. 7 or as defined under 23 CFR § 636.116, where for purposes of 23 CFR § 636.116:

a. the "person" referred to in that definition was a Core Proposer Team Member or a contractor, subcontractor, advisor, consultant or subconsultant to the Preferred Proposer or any Core Proposer Team Member; and

b. the "owner" referred to in that definition is each Enterprise and CDOT.

"Other Construction Work" has the meaning given to it Section 2.a of Part II of Appendix A to Schedule 15 (*Federal and State Requirements*).

"Other Department Project" means any Related Transportation Facility that is:

a. constructed and operated and/or maintained by or on behalf of the Enterprises and/or CDOT (other than by Developer to the extent such project is not a Developer Retained Expansion) during the Term; and

b. not otherwise incorporated in the Project under the terms of this Agreement.

"Other Department Project Procurement Material" means any design brief, specification, information memorandum, request for qualification, request for proposal, contract or other documentation issued or otherwise made available by the Enterprises and/or CDOT in connection with the tender or procurement of any Other Department Project.

"PABs" means bonds, notes or other evidence of indebtedness issued by the PABs Issuer in the form of "private activity bonds" that are also "exempt facility bonds" under the Internal Revenue Code, where such issuance is made pursuant to the provisions of Internal Revenue Code Sections 142(a)(15) and (m).

"PABs Event" means, at any time after the issuance of the Notice of Award, either:

a. the relevant allocation of PABs is rescinded or reduced by US DOT or otherwise expires without renewal with the effect that the PABs allocation shall not be available to Developer

to the extent assumed in its Base Financial Model; or

b. the PABs Issuer unreasonably (i) delays issuance (including through an unreasonable delay in release of the PABs Issuer's legal opinion or in the delivery of any other document reasonably necessary for such issuance) of, or (ii) refuses to issue the PABs in the amount that Developer's underwriters are otherwise prepared to underwrite, provided that Developer's time schedule for the issuance of the PABs includes normal and customary time periods for the PABs Issuer to issue the PABs as a conduit issuer,

provided that neither of the events referred to in paragraphs a. and b. of this definition shall be deemed to be a PABs Event if such event arises as a result of any breach of Law, Governmental Approval or this Agreement, fraud, willful misconduct, criminal conduct, recklessness, bad faith or negligence by or of the Preferred Proposer or any Developer-Related Entity.

"PABs Issuer" means BE acting solely in the capacity of a conduit issuer of PABs under the authority of Law.

"Parties" means, collectively, the Enterprises and Developer, and "Party" means either the Enterprises (taken together) or Developer.

"Payment Milestone" means any of Milestone 1, Milestone 2, Milestone 3 or Milestone 4.

"Payment Month" means:

a. each month that commences during the Operating Period; and

b. the month during which the Substantial Completion Date occurs.

"Payment Request" means a payment request submitted by Developer to the Enterprises pursuant to Section 2.1 or 2.2 of Part 2 of Schedule 4 (*Payments*).

"Performance and Measurement Tables" means the performance and measurement tables set out in Appendix A-1 and Appendix A-2 to Schedule 11 (*Operations and Maintenance Requirements*) for, respectively, the O&M Period During Construction and the Operating Period (as the same may be updated from time to time in accordance with Schedule 11 (*Operations and Maintenance Requirements*)).

"Performance Payment" means any monthly payment payable by the Enterprises pursuant to Section 1 of Part 2 of Schedule 6 (*Performance Mechanism*).

"Performance Requirements" means the requirements set out in the column headed "Performance Requirements" in the Performance and Measurement Tables.

"Permission to Enter Property Form" means CDOT Form 730 "Permission to Enter Property".

"Permit Area" means any area adjacent to any ROW Parcel or any Additional ROW Parcel for which access and/or use is required to be procured by Developer pursuant to a Permit in order to perform the Work.

"Permits" means any permit, license, temporary crossing agreement or right-of-entry agreement issued, granted or entered into by or with any Governmental Authority, Utility Owner or Railroad in connection with the performance of

any of Developer's obligations under this Agreement.

"Permitted Encumbrances" means:

a. any Encumbrance expressly permitted by Section 27.3;

b. any Encumbrance for taxes, assessments or governmental charges or levies not yet due and payable, or any Encumbrance for taxes, assessments or governmental charges or levies being contested in good faith and by appropriate proceedings for which adequate reserves have been established in accordance with GAAP; and

c. sublicenses expressly permitted under Section 7.2.2.

"Permitted Equity Transfer" means an Equity Transfer arising as a direct result of:

a. a bona fide open market transaction in securities effected on a recognized public stock exchange, excluding such transactions involving an initial public offering of Developer (whether through a direct offering or an offering of an intermediate holding company);

b. a bona fide crowdfunding transaction in securities issued pursuant to an exemption from registration in compliance with the JOBS Act of 2012 or any equivalent or successor Law provided that:

i. no Change of Control occurs as a result of such transaction; and

ii. the Enterprises have provided their prior consent to such transaction, such consent not to be unreasonably withheld;

c. the grant or enforcement of security over the membership interests in Developer to Lenders pursuant to the Financing Documents exclusively for purposes of securing the Project Debt, subject to the terms and conditions contained in this Agreement;

d. a transfer of interests between:

i. managed funds that are under common ownership or control; or

ii. the general partner or the manager (or the parent company of such general partner or manager) and any managed funds under common ownership or control with such general partner or manager (or parent company of such general partner or manager),

provided that the relevant funds and the general partner or manager of such funds (or the parent company of such general partner or manager) have been approved by the Enterprises in writing prior to the Agreement Date;

e. a reorganization or transfer of interests within a group of Persons under common Control of direct or indirect ownership interests in any Person or of any intermediate entity in the chain of ownership of such Person so long as there is no substantive change in the entity or group of

entities that ultimately have (individually or collectively) Control of such Person; or

f. a donation of legal, beneficial or equitable ownership interests in a Person to an independent non-profit organization registered with the State and exempt from taxation under Section 501(c)(3) of the Internal Revenue Code provided that:

i. no Change of Control occurs as a result of such transaction; and

ii. the Enterprises have provided their prior consent to such transaction, such consent not to be unreasonably withheld.

"Permitted Operating Period Closure" means any Closure which occurs during the Operating Period and is required for the purposes of Developer performing O&M Work in compliance with the most recently Accepted Maintenance Management Plan (including, for certainty, in the case of Renewal Work, the most recently Accepted Renewal Work Plan) that:

a. does not result in a breach of any of, and is permitted by, Sections 2.5.3, 2.6, 2.7, 2.9, 2.11.5, 2.11.9, 2.11.10, 2.11.11, 2.11.12 or 2.11.19 of Schedule 10 (*Design and Construction Requirements*), as if the provisions of such Sections applied to the performance of O&M Work, as applicable, during the Operating Period (and, for certainty, any Closure that is permitted by Section 2.11.6 of Schedule 10 (*Design and Construction Requirements*) during the Construction Period shall not constitute a Permitted Operating Period Closure); or

b. if such Closure does not satisfy the requirement set out in the first sentence of paragraph a. of this definition, has been Approved by the Department or approved by the relevant Local Agency, as applicable, as a MOT Variance.

"Persistent Breach" has the meaning given to it in Section 22.2.2.e.

"Person" means any of a natural person, a corporation, a limited liability company, a trust, a partnership, a limited liability partnership, a joint stock company, a consortium, a joint venture, an unincorporated association or any other entity recognized as having legal personality under the laws of the State, in each case as the context may require.

"Physical Damage Proceeds" has the meaning given to it in Section 25.5.1.a.

"Physical Damage Proceeds Reserve" has the meaning given to it in Section 25.5.2.a.

"Point of Slope Selection" means the location at which the roadside slope adjacent to the pavement ends, and the cut, or fill slope begins.

"Portal" means the face of the Cover where the Threshold Zone begins.

"Possession" means, in relation to any ROW Parcel or any Additional ROW Parcel, the right to access and use such ROW Parcel or Additional ROW Parcel in accordance with the terms of this Agreement, subject to:

a. rights, including statutory or public franchise rights, of

Governmental Authorities, Utility Owners, Railroads and third parties, including:

i. as contemplated by the Third Party Agreements; and

ii. as such access and use may be permitted and regulated by CDOT including through the issuance of Access Permits;

b. rights, including rights of access, granted to the Enterprises and CDOT and each of their employees, agents, consultants and subcontractors and to other Persons under this Agreement;

c. restrictions on access and/or use applicable to any such ROW Parcel or any such Additional ROW Parcel set out in:

i. easement deeds, right of entry permits and/or any Governmental Approval or Permit;

ii. any title commitments or American Land Title Association maps related to the Right-of-Way as set out in the Reference Documents; or

iii. the Beneficial Reuse and Materials Management Plan or the Materials Management Plan, and in either case later recorded;

d. any other easements, zoning restrictions, regulations, rights of way and similar restrictions on real property imposed by Law, any Governmental Approval or Permit;

e. any other restrictions or qualifications set out in Schedule 18 (*Right-of-Way*), including the establishment of hold off zones pursuant to Section 5.1 thereof; or

f. any other express restrictions or qualifications set out in this Agreement, including in Section 9.1.b.

"Possession Date" has the meaning given to it in the definition of Notice of Possession in this Part A of Annex A (*Definitions and Abbreviations*).

"Pre-Refinancing Equity IRR" means, in relation to a Refinancing, the nominal post-tax Equity IRR calculated (using the Financial Model as updated, including as to the actual revenue and cost performance of the Project, so as to be current immediately prior to the Refinancing) on the date immediately preceding the date on which such Refinancing is put into place.

"Precipitation Event" means any type of event or occurrence causing slippery road conditions including snow, drifting snow, freezing rain, sleet, ice and frost.

"Preferred Alternative" means the alternative identified as the "Preferred Alternative" pursuant to NEPA in the FEIS related to the Project.

"Preferred Proposer" has the meaning given to it in the Recitals.

"Preliminary Equity IRR" means 9.52%.

"Preliminary Supervening Event Submission" has the meaning given to it in Section 15.1.2.b.i.

"Principal Indemnified has the meaning given to it in Section 24.2.

Parties"

"Principal Subcontractor Direct Agreement" means any agreement in substantially the form attached as Schedule 19 (*Forms of Direct Agreements*) by and among the Enterprises, Developer and a Principal Subcontractor.

"Principal Subcontractors" means:

a. the Construction Contractor;

b. the O&M Contractor; and

c. any other Subcontractor under a Principal Subcontract of the type referenced in paragraph c. of the definition thereof in this Part A of Annex A (*Definitions and Abbreviations*).

"Principal Subcontracts" means:

a. the Construction Contract;

b. the O&M Contract; and

c. any other Subcontract between Developer and another Subcontractor that individually, or in aggregate with all other Subcontracts between Developer and such Subcontractor, has a value as determined by the Enterprises (acting reasonably) in excess of (A) 10% of the Construction Work in aggregate, (B) 40% of the O&M Work in any given Contract Year or (C) 15% of the O&M Work in any given consecutive five Contract Year period during the Operating Period, as applicable.

"Private Utility" means a Utility that is owned by a Private Utility Owner.

"Private Utility Owner" means each of:

a. AT&T Corp.;

b. Comcast Holdings Corporation;

c. Level 3 Communications, Inc.;

d. MCI Communications Services, Inc. d/b/a Verizon Business Services;

e. NuStar Logistics, L.P.;

f. Phillips 66 Company;

g. Public Service Company of Colorado;

h. Qwest Corporation d/b/a CenturyLink QC;

i. Sprint; and

j. Zayo Group, LLC,

or any Affiliate of the same with which the CDOT enters into a URA.

"Process Control" means the activities performed by or on behalf of Developer to ensure and document that a product meets the requirements of this Agreement, which activities may include checking, materials handling and construction procedures, calibrations and maintenance of equipment, shop drawing review, document control, production process control, and any sampling, testing, and inspection done for such purposes.

"Programmatic means the Programmatic Agreement Among Federal Highway

Agreement" Administration, Colorado State Historic Preservation Officer, and Colorado Department of Transportation Regarding Implementation of The Interstate 70 East Corridor Project - Interstate 25 to Tower Road.

"Progress Report" means Developer's progress submittal described in Section 4 of Schedule 8 (*Project Administration*).

"Progress Schedule " means the Project Schedule provided with the Progress Report as set out in Section 3.3.5 of Schedule 8 (*Project Administration*).

"Prohibited Act" means:

a. an act committed in contravention of Section 8.3.2;

b. offering, giving or agreeing to give to any Governmental Authority (including either Enterprise or CDOT) or any public official, civil servant, officer, director, agent or employee of any such Governmental Authority, any bribe, gift or consideration of any kind as an inducement, commission or reward:

i. for doing or not doing (or for having done or not having done) any act in relation to the obtaining or performance of this Agreement or any other related contract with either Enterprise or the Federal government or the State, or any other Governmental Authority (including CDOT);

ii. for showing or not showing favor or disfavor to any Person in relation to this Agreement or any other related contract with either Enterprise or the Federal government or the State, or any other Governmental Authority (including CDOT); or

c. defrauding or attempting to defraud or conspiring to defraud either Enterprise or the Federal government or the State, or any division, subdivision or agency of either of them (including CDOT),

in each case regardless of whether or not it is a criminal offence pursuant to Law.

"Project" has the meaning given to it in the Recitals.

"Project Agreement" shall have the same meaning as Agreement.

"Project Agreement Amendment" means an amendment to this Agreement to become effective on the Financial Close Date, which shall reflect any adjustments or amendments that have been accepted or agreed, as applicable, by the Enterprises and Developer pursuant to Annex A to Schedule 1 (*Financial Close*), including:

a. the Financial Close Base CPP calculated pursuant to Section 4(g) of Annex A to Schedule 1 (*Financial Close*);

b. the Base Case Equity IRR calculated pursuant to Section 4(h) of Annex A to Schedule 1 (*Financial Close*);

c. the replacement of the Base Financial Model attached as Schedule 26 (*Base Financial Model*) with a copy of the Financial Model Accepted by the Enterprises pursuant to Section 2.2(h)(i) of Schedule 1 (*Financial Close*); and

d. amendments to the definitions of "Baseline Substantial

Completion Target Date" and "Milestone Completion Target Date" in this Part A of Annex A (*Definitions and Abbreviations*) in each case to reflect, on a day for day basis, any delay in achieving Financial Close relative to November 30, 2017 (the date assumed in the ITP).

"Project Debt" means bona fide indebtedness (including subordinated indebtedness) under the Financing Agreements for or in respect of funds borrowed or incurred (including bona fide indebtedness with respect to any financial insurance issued for funds borrowed) or for the value of goods or services rendered or received, the repayment of which has specified payment dates and, in any such case, is secured by one or more Security Documents, where such Project Debt:

a. includes, subject to the exclusions in paragraph b. of this definition:

i. principal, capitalized interest, accrued interest, customary and reasonable lender, financial insurer, agent and trustee fees, costs, expenses and premiums with respect thereto, payment obligations under interest rate and inflation rate hedging agreements or other derivative facilities with respect thereto, reimbursement obligations with respect thereto, lease financing obligations, and Breakage Costs; and

ii. PABs and TIFIA Loans (and TIFIA guaranties and credit support), together with the obligations arising thereunder; and

b. excludes:

i. Equity Member Debt;

ii. any indebtedness of Developer or any Equity Member of Developer that is secured by any interests less than Developer's entire interest in, and its rights and obligations under, this Agreement, such as indebtedness secured only by an assignment of economic interest in Developer or of rights to cash flow or dividends from Developer;

iii. any increase in indebtedness to the extent resulting from an agreement or other arrangement Developer enters into or first becomes obligated to repay after it was aware (or should have been aware, with reasonable due diligence) of the occurrence or prospective occurrence of an event of termination under the Agreement, including Developer's receipt of a Termination Notice and/or occurrence of an Enterprise Default of the type entitling Developer to terminate the Agreement; and

iv. any such indebtedness that would otherwise be Project Debt to the extent the Collateral Agent has not notified the Enterprises of such indebtedness and the related Financing Documents in accordance with this Agreement.

"Project Directory" means the directory described in Section 12 of Schedule 8 (*Project Administration*).

"Project Information" has the meaning given to it in Section 3.1.a.

"Project Insurance Change" means any net increase or net decrease in the Actual Benchmarked Insurance Cost relative to the Proposal Insurance Cost (including any such increase or decrease resulting from a change in the amount of any deductible or resulting from Developer's claims history in relation to the Project), excluding only any increase or decrease:

a. arising from:

i. any unavoidable circumstances generally prevailing in the Relevant Insurance Markets; and

ii. any claims history in relation to the Project resulting from the acts or omissions of the Enterprises and/or CDOT; or

b. taken into account in any calculation of Change in Costs made pursuant to this Agreement,

with the amount of any such net increase or net decrease to be expressed as a positive number in the event of a net increase and a negative number in the event of a net decrease.

"Project Intellectual Property" means Intellectual Property created, used, applied or reduced to practice by Developer or any other Developer-Related Entity in connection with the Project or the Work, but excluding that which is:

a. owned by the Enterprises, CDOT, or otherwise made available to Developer by the Enterprises pursuant to this Agreement and as a result of its performance of the Work; or

b. owned by any Person other than the Enterprises, CDOT or a Developer-Related Entity.

"Project License" has the meaning given to it in Section 7.2.1.a.

"Project License End Date" means, for each ROW Parcel and each Additional ROW Parcel, the earliest of:

a. the date on which the Project License is revoked pursuant to Section 7.2.1.c;

b. the Substantial Completion Date with respect to any ROW Parcels and any Additional ROW Parcels (or any portion of any thereof) that are outside the O&M Limits After Construction;

c. with respect to any such ROW Parcel and any Additional ROW Parcel that is provided in the form of a Temporary ROW Easement, the date specified in or required by the terms of such easement; and

d. with respect to any ROW Parcel on which the Maintenance Yard is located, the effective date of any termination of the Project License with respect thereto pursuant to Section 7.2.1.d.

"Project License Start Date"	means, for each ROW Parcel and each Additional ROW Parcel, the Possession Date specified in the Notice of Possession delivered by the Enterprises to Developer pursuant to Section 7.2.1.b with respect to such parcel.
"Project Records"	has the meaning given to it in Section 19.1.1.
"Project Schedule "	means, initially, the Baseline Schedule and, once Approved pursuant to Section 3.3 of Schedule 8 (*Project Administration*), the then current Revised Baseline Schedule.
"Project Special Provisions"	means the Project Special Provisions set out in Appendix A to any Section of Schedule 10 (*Design and Construction Requirements*).
"Project Standards"	means: a. the Construction Standards; and b. the O&M Standards.
"Project Third Parties"	means each counterparty (excluding any Party to this Agreement and CDOT) to a Third Party Agreement.
"Property Management"	has the meaning given to it in Section 2.1.1 of Schedule 18 (*Right-of-Way*).
"Proposal"	means the Preferred Proposer's Proposal, as defined in, and submitted by it in response to, the ITP.
"Proposal Benchmarked Insurance Cost"	means, in respect of any Insurance Review Period: a. the Proposal Insurance Cost with respect to the applicable Insurance Review Period; *minus* b. the Base Benchmarked Insurance Deduction in respect of the applicable Insurance Review Period.
"Proposal Insurance Cost"	means, in respect of any Insurance Review Period: a. indexed annually from July 1, 2017 to the first day of such Insurance Review Period; *plus* b. the amount calculated pursuant to paragraph a. of this definition, indexed from the first day of such Insurance Review Period to the second Insurance Renewal Date in such Insurance Review Period.
"Proposal Schedule "	means the draft Baseline Schedule submitted by the Preferred Proposer with Developer's Proposal pursuant to Section 2.3.3. of Part F of the ITP.
"Proposer" and "Proposers"	each has the meaning given to it in the Recitals.
"Proprietary Intellectual Property"	means Project Intellectual Property that is patented or copyrighted by any Developer-Related Entity (other than Developer), or, if not patented or copyrighted, is created, held and managed as a trade secret or confidential, proprietary information by the relevant Developer-Related Entity, excluding any item of Project Intellectual Property that is produced for multiple purposes and is not unique to the technology that is being applied to or for the Project.
"Protection in Place"	subject to Section 4.1.4 of Schedule 10 (*Design and Construction Requirements*), has the meaning given to it in the applicable URA.

"Protection Period" means the period from 3:00 pm Eastern Standard Time on July 18, 2017 to and including:

a. with respect to any TIFIA Financing, the date that any loan agreement evidencing TIFIA Financing is entered into between Developer and US DOT; and

b. with respect to any Bond Financing, the date of the signing of the bond purchase agreement among Developer, the underwriters as bond purchasers and, in respect of any issuance of PABS, the PABs Issuer.

"Public ROW Records" means any record affecting a ROW Parcel that is maintained by:

a. the Colorado Department of Public Health and Environment, the Colorado Department of Labor and Employment, Division of Oil and Public Safety, or the EPA; or

b. the:

i. County Assessor's office;

ii. County Treasurer's office; or

iii. office of the Clerk and Recorder,

with respect to paragraph b., for the county in which the ROW Parcel is located, to the extent that such records were referenced in any title commitment in the possession of or made available to the Preferred Proposer and/or the Developer-Related Entities on or prior to the Setting Date.

"Public Safety Order" means a rule, order or directive from the U.S. Department of Homeland Security, the State Department of Public Safety (including the Division of Homeland Security and Emergency Management) or by any Emergency Service regarding specific security threats to the Project or the region within the State in which the Project is located or which the Project serves, to the extent such rule, order or directive:

a. requires specific changes in Developer's normal design, construction, operation or maintenance procedures in order to comply therewith; and

b. must be complied with by Developer (or any Principal Subcontractor in connection with performance of the Work) as a matter of Law.

"Public Utility" means a Utility that is owned by a Publicly Owned Utility.

"Publicly Owned Utility" means each of:

a. Aurora Water;

b. the City and County of Denver, acting through its Board of Water Commissioners;

c. the City and County of Denver Wastewater Management Division; and

d. the Metropolitan Wastewater Reclamation District.

"Punch List" means each Milestone Completion Punch List and the Substantial Completion Punch List.

"Punch List Item" means any minor Defect or Nonconforming Work which individually, and in aggregate with all other such Punch List Items, will not have any material or adverse effect on the normal, uninterrupted and safe use and operation of the affected Element of the Project for its intended purpose.

"Qualifying Change in Law" means:

a. a Change in Law that requires Developer to incur any additional expenditure that (i) would be treated as a capital expenditure in accordance with GAAP and (ii) is in connection with the performance of O&M Work After Construction (whether such expenditure is required to be incurred either during the Construction Period or during the Operating Period); or

b. any enactment, promulgation, adoption, change or modification of Federal Law with respect to the investigation, removal, treatment, storage, transportation, management and/or remediation of (i) Unexpected Groundwater Contamination Conditions or (ii) Unexpected Hazardous Substances that would, in the case of (i) or (ii), constitute a Change in Law if proviso (i) to the definition of Change in Law in this Part A of Annex A (*Definitions and Abbreviations*) were disregarded that requires Developer to incur any additional expenditure that (A) would be treated as a capital expenditure in accordance with GAAP and (B) is in connection with the performance of O&M Work After Construction (whether such expenditure is required to be incurred either during the Construction Period or during the Operating Period),

excluding in the case of a. and b. any:

c. Discriminatory Change in Law; and

d. Change in Law that is made in response to any breach of Law, Governmental Approval, Permit or this Agreement, or fraud, willful misconduct, criminal conduct, recklessness, bad faith or negligence of any Developer-Related Entity,

provided that any Change in Costs payable to Developer as a result of the occurrence of a Compensation Event falling within this definition shall not include any Change in Costs of Developer that do not solely and exclusively relate to the performance of O&M Work After Construction.

"Qualifying Refinancing" means any Refinancing that will give rise to a Refinancing Gain greater than zero which is not an Exempt Refinancing.

"Quality Assurance Oversight" means the act of testing or inspecting of the Work performed by qualified testing or inspecting personnel employed by the Department or its designated agent to independently establish conformity to this Agreement.

"Quality Management Plan" means, from time to time, the then current plan that satisfies the requirements of Section 6 of Schedule 8 (*Project Administration*) and has been submitted by Developer and Approved by the Department pursuant to Schedule 8 (*Project Administration*).

"Quality Records Database" means the secure web-based application for recording results of the Department verification reviews and responses to nonconformance notices, as described in Schedule 8 (*Project Administration*).

"Railroad" means either the tracks, bridges and systems used for rail traffic in the vicinity of I-70 Mainline, or the UPRR, BNSF or DRIR, as the context may require.

"Railroad Forces" means Railroad engineering and construction personnel, or Railroad designated contractors employed or contracted directly by the respective Railroad.

"Rating Agency" means each of:

a. Fitch, Inc.;

b. Moody's Investors Service, Inc.;

c. Standard & Poor's Ratings Services; and

d. DBRS, Inc.,

provided in each case that such entity is at the relevant time a Registered Rating Agency.

"Reasonable Efforts" means all those steps in the power of the relevant Party that are capable of producing the desired result, being steps which a prudent, determined and reasonable person desiring to achieve that result would take, provided that, subject to its other express obligations under this Agreement:

a. where the relevant Party is either the Enterprises or Developer, the relevant Party shall not be required to expend funds except for those:

i. reasonably incidental or ancillary to the steps to be taken by the relevant Party (including its reasonable travel expenses, correspondence costs and general overhead expenses); or

ii. that the other Party agrees to reimburse in advance; and

b. where the relevant Party is the Enterprises (or the Department), the Enterprises (or, as applicable, the Department) shall not be required to:

i. take any action to the extent uncommitted budgeted funds are unavailable to undertake such action;

ii. take any action that is contrary to this Agreement, Law, any Governmental Approval or the public interest, or decline, refrain or abstain from taking any action that is in the public interest, as determined by the Enterprises in their discretion;

iii. exercise or refrain, decline or abstain from exercising any statutory or administrative law power, authority or discretion;

iv. undertake any mitigation measure that might be available as a result of its status as a Governmental Authority, and that would not normally be available to a private commercial counterparty to an

agreement such as this Agreement;

v. take a position that would not be usual and customary for the Enterprises or CDOT to take in addressing similar circumstances affecting other projects (except for usual and customary arrangements that are incompatible with the Project's contracting methodology); or

vi. refrain from concurring with a position taken by any Governmental Authority if the Enterprises believe that position to be correct.

"Recognized Hazardous Materials" has the meaning given to it in Section 23.1.1 of Schedule 17 (*Environmental Requirements*).

"Reconciliation" has the meaning given to it in Section 15.6.2.

"Reevaluation" means any NEPA evaluation required or prepared pursuant to 23 CFR § 771.129.

"Reference Design" means the preliminary technical blueprint and description of essential design elements for the Project set out in the Reference Documents.

"Reference Document" means each of the materials, documents and data listed in Schedule 29 (*Reference Documents*) and made available prior to the Final Project Information Date pursuant to Section 3.1.a.

"Refinancing" means:

a. any amendment, variation, novation, supplement or replacement of any Financing Document;

b. the exercise of any right, or the grant of any waiver or consent, under any Financing Document;

c. the disposition of any rights or interests in, or the creation of any rights of participation in respect of, any Financing Document (other than any Equity Member Funding Agreement) or the creation or granting of any other form of benefit or interest in either a Financing Document or the contracts, revenues or assets of Developer whether by way of security or otherwise; or

d. any other arrangement put in place by Developer or another person which has an effect which is similar to any of a. to c. above or which has the effect of limiting Developer's ability to carry out any of a. to c. above.

"Refinancing Gain" means an amount equal to the greater of zero and an amount equal to (A-B-C), where:

A = the net present value (using the Base Case Equity IRR as the discount rate) of the Distributions projected immediately prior to the Refinancing (taking into account the effect of the Refinancing and using the Financial Model as updated (including as to the performance of the Project) so as to be current immediately prior to the Refinancing) to be made over the remaining term of this Agreement following the Refinancing;

B = the net present value (using the Base Case Equity IRR as the discount rate) of the Distributions projected immediately prior to the Refinancing (but without taking into account the effect of the Refinancing and using the

Financial Model as updated (including as to the performance of the Project) so as to be current immediately prior to the Refinancing) to be made over the remaining term of this Agreement following the Refinancing; and

C = any adjustment required to increase the Pre-Refinancing Equity IRR to the Base Case Equity IRR, if applicable.

"Registered Rating Agency" means a nationally recognized statistical rating organization registered with the Office of Credit Rating of the U.S. Securities and Exchange Commission.

"Reinstatement Plan" has the meaning given to it in Section 25.5.1.b.i.

"Reinstatement Work" has the meaning given to it in Section 25.5.1.a.

"Related Transportation Facility" means any existing and future bridge, highway, street and road or other transportation facility of any mode, including:

a. directly related component facilities; and

b. upgrades and expansions thereof,

that, in any such case, are or will be connecting with, or crossing under or over, the Project, but which is not (at the relevant time) part of the Project, including:

c. Denver Planned Projects; and

d. all CCD Identified Future Improvements.

"Release" means any emission, spill, seepage, leak, escape, leaching, discharge, injection, pumping, pouring, emptying, dumping, disposal, migration, or release of Hazardous Substances from any source into or upon the Environment or any Improvement, including any of the foregoing, or any other action, that exacerbates an existing Release or condition of Hazardous Substances contamination.

"Release for Construction Documents" means the drawings (including plans, elevations, sections, details and diagrams), specifications, shop drawings, drawings, samples, reports and calculations approved by Developer for construction as required by Schedule 8 (*Project Administration*).

"Relevant Contract Year" has the meaning given to it in Section 2.3.

"Relevant Event" means any Delay Relief Event or Compensation Event.

"Relevant Insurance Markets" the insurance markets which collectively insure the majority of transportation related infrastructure projects in the United States from time to time, which as of the Agreement Date are New York, Bermuda and London.

"Relevant Milestone Payment Request Due Date" has the meaning given to it in Section 2(a) of Schedule 5 (*Milestone Payments*).

"Relevant Obligation" has the meaning given to it in Section 24.2.g.i.

"Relief Event" means:

a. any of the following ("Delay Relief Events"):

i. any Unexcused Railroad Delay;

ii. any Unexpected Governmental Approval Delay;

iii. any breach by the City of Denver of the Denver IGA

that results in:

A. the duration of any street occupancy permit issued by the City of Denver not being for a duration equal to the Reasonable Construction Time Period (as defined in Section 4.A.(iii) of the Denver IGA) plus 10% of that time period; or

B. the City of Denver unreasonably withholding or delaying any permit that it is required to issue in connection with the Construction Work pursuant to Section 4.A.(iv) of the Denver IGA,

provided that Developer has complied with the City of Denver permit process set out in Reference Document number 29.8.01; and

iv. any Force Majeure Event or any Relief Event to the extent that such event constitutes a Delay Relief Event pursuant to Section 33.1.6.c.i.C.II;

b. any Force Majeure Event;

c. any:

i. fire or explosion;

ii. geomagnetic storm; or

iii. earthquake;

d. riot or illegal civil commotion;

e. any Change in Law (excluding (i) any Discriminatory Change in Law and (ii) any Qualifying Change in Law);

f. any Third Party Release of Hazardous Substances that occurs during the Construction Period;

g. any accidental loss or damage to the Right-of-Way, any Additional Right-of-Way or any Permit Areas (excluding Developer-risk Permit Areas) in respect of which Developer holds Permits;

h. any failure by the City of Denver:

i. to provide to Developer within 15 Working Days any comments in connection with the Construction Work that it is required to provide in relation to any submittal within 10 “business days” pursuant to the Preamble in Exhibit K of the Denver IGA; or

ii. in the event that any 10 “business day” period referred to in the Preamble in Exhibit K of the Denver IGA is adjusted as contemplated in such Preamble, to provide to Developer within five Working Days of the expiry of such adjusted period comments in connection with the Construction Work that is the subject of the relevant submittal;

i. any incident of physical damage to an Element of the Project or delay of or disruption to the Work caused by a

failure by the Cover Top Maintainer to perform the City of Denver's obligations in accordance with the applicable terms of the Cover Maintenance Agreement during the Operating Period;

j. Developer's obligation to comply with Section 12.2.b with respect to any Related Transportation Facility that is not Known or Knowable (other than with respect to any required capital expenditure, to which paragraph n. of the definition of Compensation Event in this Part A of Annex A (*Definitions and Abbreviations*) shall apply);

k. any weather event manifesting severe and historically unusual wind and/or liquid precipitation conditions directly affecting any part of the Site that is recognized as a "severe local storm", or "flood" event by the National Oceanic and Atmospheric Administration's National Weather Service in a published notice, alert or warning (a "Severe Weather Event");

l. any delay of or disruption to the Work caused by the operation or maintenance of the Limited O&M Work Segments, but only to the extent such operation or maintenance is not the responsibility of Developer (or another Person under common Control with Developer) pursuant to this Agreement or otherwise; or

m. any unusual and unreasonable delay by the Colorado Department of Public Health and Environment in issuing, agreeing to modify, renewing or extending any Remediation Activities Discharging to Surface Waters Permit, Stationary Source Air Quality Permit or Subterranean Dewatering or Well Development Permit,

in each case unless and to the extent such event arises as a result of any breach of Law, Governmental Approval, Permit or this Agreement, or fraud, willful misconduct, criminal conduct, recklessness, bad faith or negligence by or of any Developer-Related Entity.

"Renewal Element" means an Element which has a Useful Life Baseline Requirement specified in Appendix B to Schedule 12 (*Handback Requirements*).

"Renewal Work" means maintenance, repair, reconstruction, rehabilitation, restoration, renewal or replacement of any Element (excluding any Element within or that forms part of the Limited O&M Work Segments) or part thereof that is not normally included, in accordance with Good Industry Practice, as an annually recurring cost in maintenance and repair budgets for transportation facilities (and associated equipment) of a similar nature and located in a similar environment to the Project.

"Renewal Work DBE Goal" has the meaning given to it in Section 6.2.2.f of Schedule 15 (*Federal and State Requirements*).

"Renewal Work OJT Goal" has the meaning given to it in Section 6.3.2 of Schedule 15 (*Federal and State Requirements*).

"Renewal Work Plan" means the plan described in Section 6.1 of Schedule 11 (*Operations and Maintenance Requirements*) (as updated in accordance with Schedule 11 (*Operations and Maintenance Requirements*)).

"Renewal Work Schedule "	means the schedule required as part of the Renewal Work Plan.
"Representatives"	has the meaning given to it in Section 18.2.1.a.
"Requested Relocation"	subject to Section 4.1.4 of Schedule 10 (*Design and Construction Requirements*), means any Utility Relocation of a Private Utility that the relevant Private Utility Owner requests be performed by Developer pursuant to the terms of any URA.
"Required Action"	has the meaning given to it in Section 23.4.3.
"Required Environmental Approvals"	has the meaning given to it in Section 8 of Schedule 17 (*Environmental Requirements*).
"Required Guarantor"	means any Guarantor for a Principal Subcontractor (or any member thereof) whose Work is not completed at the relevant time, provided that such Guarantor shall cease to be a Required Guarantor at such time that the Enterprises Accept written evidence submitted by Developer that the relevant Principal Subcontractor (taking into account any other guaranties) possesses the financial and technical capability to perform or cause the performance of all remaining Work under the relevant Principal Subcontract in full compliance with its terms in the absence of the support of such Guarantor.
"Required Principal Subcontractor Member"	means any member of a Principal Subcontractor which Principal Subcontractor's Work is not completed at the relevant time, provided that such member shall cease to be a Required Principal Subcontractor Member at such time that the Enterprises Accept written evidence submitted by Developer that the relevant Principal Subcontractor (absent such member, and taking into account any guaranties) possesses the financial and technical capability to perform or cause the performance of all remaining Work under the relevant Principal Subcontract in full compliance with its terms in the absence of such member.
"Rescue Refinancing"	means a Refinancing by the Lenders upon the occurrence of a default or an event of default under the Financing Agreements.
"Residual Element"	means an Element which has a specified Residual Life Minimum Requirement in Appendix A to Schedule 12 (*Handback Requirements*).
"Residual Life"	means, for an Element, the period remaining until the Element will next require reconstruction, rehabilitation, restoration, renewal or replacement.
"Residual Life at Handback"	means the Residual Life of an Element calculated at the Expiry Date determined through the application of the Residual Life Methodology and Residual Life inspections and by assuming that the Element is subject to maintenance after the Expiry Date to the same standards and requirements, and at the same frequency, as Developer is required to perform Routine Maintenance on such Element in accordance with the terms of this Agreement.
"Residual Life Minimum Requirement"	means, for any Residual Element, the number of years of Residual Life at Handback specified in the "Residual Life at Handback" column for such Residual Element in Appendix A to Schedule 12 (*Handback Requirements*).
"Residual Life Methodology" or "RLM"	means the evaluation and calculation methodology by which the Residual Life of any Element will be calculated at the Expiry Date (including (a) the methodology by which any necessary Renewal Work will be identified and (b) in the case of bridge decks, methodology that complies with the

requirements set out in Section 2.1.a of Schedule 12 (*Handback Requirements*)) to ensure that each Residual Element meets or exceeds its Residual Life Minimum Requirement.

"Residual Life Methodology Report" means the report prepared by Developer in accordance with Section 3.3 of Schedule 12 (*Handback Requirements*).

"Restricted Change" means any Enterprise Change (or aspect thereof) proposed in an Enterprise Change Notice or a Directive Letter that would, if implemented:

a. require the Work (as changed by the proposed Enterprise Change) to be performed in a way that:

i. violates Law;

ii. is inconsistent with Good Industry Practice; or

iii. gives rise to a material risk to the health or safety of any person; or

b. cause the revocation of any existing Governmental Approval, Permit or third party consent that is necessary for the performance of the existing Work under circumstances such that it would be impossible or highly unlikely that Developer would be able to obtain a new or amended equivalent Governmental Approval, Permit or third party consent relating to the Work (as changed by the proposed Enterprise Change);

c. materially and adversely affect Developer's ability to carry out the Work; and/or

d. materially and adversely change the nature of the Project (including its risk profile).

"Restricted Transfer Period" means the period commencing on the Agreement Date and ending on (but not including) the second anniversary of the Substantial Completion Date.

"Reviewable Deliverable" means any Deliverable that is a Deliverable for Approval, a Deliverable for Acceptance or a Deliverable for Information.

"Revised Baseline Schedule " means the then current revision to the Baseline Schedule (including to any prior Revised Baseline Schedule), which has been submitted by Developer and Approved by the Enterprises pursuant to Section 3.3.4.b of Schedule 8 (*Project Administration*).

"RFC Documents" means Release for Construction Documents.

"RFP" has the meaning given to it in the Recitals.

"Right-of-Way" means, collectively, all of the land, improvements and fixtures that are located within all ROW Parcels, but in each case with effect only from the Project License Start Date and only until the Project License End Date, in each case, for the relevant ROW Parcel.

"Right-of-Way Betterment" means appreciation in the value of a property due to beneficial public works executed in its near vicinity.

"Right-of-Way Relocation" means displacing a current resident or occupant to a new location.

"ROD" has the meaning given to it in the Recitals.

"ROD Construction Limits"	means the construction limits of the Project identified in Reference Document 29.10.9.07.
"Routine Maintenance"	means maintenance activities that are scheduled in advance and occur on a regular basis, such as weekly, monthly, quarterly, semi-annually or annually, which are normally included as an annually recurring cost in maintenance and repair budgets for transportation facilities (and associated equipment) of similar natures and in similar environmental conditions as the Project.
"Routine O&M Work ESB Goal"	has the meaning given to it in Section 6.2.2.b of Schedule 15 (*Federal and State Requirements*).
"Routine O&M Work"	means all O&M Work, excluding Renewal Work.
"ROW Parcel"	means each parcel of land that either: a. is referred to in the "Parcel #" column in the ROW Schedule, each as identified in the Right-of-Way Exhibits in the Contract Drawings; or b. comprises part of the Existing CDOT Right-of-Way, but, with respect to any partial acquisition identified in the ROW Schedule, only including any part thereof that Developer elects to have the Department acquire and deliver pursuant to Section 1.3 of Schedule 18 (*Right-of-Way*).
"ROW Schedule "	means the table set out in Appendix A to Schedule 18 (*Right-of-Way*).
"RRA"	means any of: a. the BNSF RRA; b. the DRIR RRA; and c. the UPRR RRA.
"Safety Compliance"	means any and all improvements, repair, reconstruction, rehabilitation, restoration, renewal, replacement and/or changes in configuration or procedures in relation to the Project to correct a specific safety condition or risk in relation to the Project that the Enterprises, CDOT or another Governmental Authority that has relevant jurisdiction have reasonably determined to exist.
"Safety Compliance Order"	means a written order or directive from the Enterprises to Developer to implement Safety Compliance, provided that such order or directive shall not be used to effect a change to the Technical Requirements or the Project Standards or safety-related portions of the Work affected by a Change in Law.
"Schedule Delay Period"	has the meaning given to it in Section 15.3.1.c.i.
"SDBPP"	has the meaning given to it in Section 5.1 of Schedule 15 (*Federal and State Requirements*).
"Second Handback Inspection Report"	means the report prepared by Developer in accordance with Sections 3.11.a.i and 3.11.b of Schedule 12 (*Handback Requirements*).
"Security Documents"	means: a. the documents listed in Section B of Annex A to the Lenders Direct Agreement executed on or about the Financial Close Date; and b. any other mortgage, deed of trust, guarantee, pledge, lien,

indenture, trust agreement, hypothecation, assignment, collateral assignment, financing statement under the Uniform Commercial Code of any jurisdiction, security instrument or other charge or encumbrance of any kind, including any lease in the nature of a security instrument, given to any Lender as security for Project Debt or Developer's obligations pertaining to Project Debt to the extent permitted by this Agreement.

"Service Line" means:

a. a Utility line, the function of which is to directly connect the improvements on an individual property to another Utility line located off such property, which other Utility line connects more than one such individual line to a larger system; or

b. a Utility line on public or private property that services structures located on such property.

"Setting Date" means April 25, 2017.

"Severe Weather Event" has the meaning given to it in paragraph k. of the definition of Relief Event in this Part A of Annex A (*Definitions and Abbreviations*).

"Similar Project" means any highway facility within the State or elsewhere in the United States, including a construction or reconstruction project involving such a facility, that is more similar than not to the Project based on any one or more of the following elements: size, value, scope, technical complexity, geography, usage and risk profile.

"Site" means, at any time:

a. the Right-of-Way;

b. any Additional Right-of-Way;

c. any Permit Areas in respect of which Developer holds Permits at that time; and

d. any Temporary Properties in respect of which Developer owns or holds Temporary Property Rights at that time.

"Small Business and Workforce Goals" has the meaning given to it in Section 6.1 of Schedule 15 (*Federal and State Requirements*).

"Snow and Ice Control Commencement Date" has the meaning given to it in Section 3 of Part 3 of Schedule 3 (*Commencement and Completion Mechanics*).

"Snow and Ice Control Equipment" has the meaning given to it in Section 11.6 of Schedule 11 (*Operations and Maintenance Requirements*).

"Snow and Ice Control Plan" means the plan described in Section 9.3 of Schedule 11 (*Operations and Maintenance Requirements*).

"Snow and Ice Control Services" means the snow and ice control services as described in Section 11 of Schedule 11 (*Operations and Maintenance Requirements*).

"Snow Route" means the documented configuration and path(s) traversed by a snowplow or Spreader documented in Developer's Snow and Ice Control Plan.

"Special Events" means events expected to produce higher than average traffic on the I-70 East Corridor.

"Special Permit" means a Permit issued by CDOT to permit a Person with a right under Law to have access to the Right-of-Way and any Additional Right-of-Way for a purpose which does not include carrying out any excavation in order to exercise that right.

"Special Provisions" means Sections 36, 46.1 and 53.

"Specialist Inspections" means inspections of specified Elements or components for which testing, special tools or equipment are necessary, including inspections required to be undertaken in accordance with Section 8.4 of Schedule 11 (*Operations and Maintenance Requirements*).

"Specified Additional Insured" means:

a. each Indemnified Party;

b. any Railroad, including its officers, directors and employees, to the extent required to be treated as an additional insured under any RRA;

c. any Utility Owner, including its officers, directors and employees, to the extent required to be treated as an additional insured under any URA, and Sprint;

d. any Lender, to the extent required to be an additional insured under any Financing Document; and

e. any other Person as and when agreed by the Parties or otherwise reasonably required by the Enterprises.

"Spreader" means a vehicle capable of spreading salt, de-icers and anti-icers.

"Sprint" has the meaning given to it in Section 4.1.3 of Schedule 10 (*Design and Construction Requirements*).

"Sprint Reimbursement Agreement" has the meaning given to it in Section 4.1.3 of Schedule 10 (*Design and Construction Requirements*).

"Sprint Work Order" has the meaning given to it in Section 4.1.3 of Schedule 10 (*Design and Construction Requirements*).

"Standard Special Provisions" means the Standard Special Provisions listed in Section 4 of Appendix A to Schedule 10A (*Applicable Standards and Specifications*).

"Standard Specifications" means the CDOT Standard Specifications.

"State" means the State of Colorado.

"State Sales Tax" has the meaning given to it in Section 30.1.3.b.

"Storm Drain" means a network of pipes that connects inlets, manholes, and other drainage features to an outfall.

"Subcontract" means any contract (at any tier) entered into by Developer, the Construction Contractor, the O&M Contractor or a Subcontractor including a Supplier with one or more third parties directly in connection with the carrying out of the Work or any of Developer's other obligations under this Agreement.

"Subcontractor" means any party, other than Developer, to a Subcontract.

"Subcontractor Breakage Costs" means Losses that have been or will be reasonably and properly incurred by Developer under a Principal Subcontract as a direct result of the termination of this Agreement (and which Losses shall not include lost profit or lost opportunity, but may, for certainty, include payment to a Principal

Subcontractor for work performed prior to the Termination Date, but not yet paid for by Developer), but only to the extent that:

a. the Losses are incurred in connection with the Project and in respect of the Work required to be performed by Developer, including:

i. any materials or goods ordered or Subcontracts placed that cannot be cancelled without such Losses being incurred;

ii. any expenditure incurred in anticipation of the performance or the completion of Work in the future; and

iii. the cost of demobilization including the cost of any relocation of equipment used in connection with the Project;

b. the Losses are incurred under arrangements and/or agreements that are consistent with terms that have been entered into in the ordinary course of business and on an arm's length basis, and that otherwise comply with this Agreement; and

c. Developer and the relevant Principal Subcontractor have each used their Reasonable Efforts to mitigate such Losses.

"Substantial Completion" means the satisfaction of all Substantial Completion Conditions, as confirmed by the Enterprises' issuance of the Substantial Completion Certificate.

"Substantial Completion Certificate" has the meaning given to it in Section 5(a) of Part 5 of Schedule 3 (*Commencement and Completion Mechanics*).

"Substantial Completion Conditions" has the meaning given to it in Section 1 of Part 5 of Schedule 3 (*Commencement and Completion Mechanics*).

"Substantial Completion Date" has the meaning given to it in Section 5(a) of Part 5 of Schedule 3 (*Commencement and Completion Mechanics*).

"Substantial Completion Deduction Amount" means the amount calculated in accordance with Section 1 of Part 1 of Schedule 6 (*Performance Mechanism*).

"Substantial Completion Milestone Payment" means the Milestone Payment payable in respect of the achievement of Substantial Completion.

"Substantial Completion Payment" has the meaning given to it in Section 3(b) of Schedule 5 (*Milestone Payments*).

"Substantial Completion Punch List" has the meaning given to it in Section 2(b) of Part 7 of Schedule 3 (*Commencement and Completion Mechanics*).

"Substantial Completion Punch List Items" has the meaning given to it in Section 2(b) of Part 7 of Schedule 3 (*Commencement and Completion Mechanics*).

"Supervening Event" means any:

a. Relief Event;

b. Compensation Event; or

c. Appendix B Parcel Unexpected Hazardous Substances Event to the extent that it does not constitute a

Compensation Event.

"Supervening Event Submission"	means any Preliminary Supervening Event Submission or any Detailed Supervening Event Submission.
"Supervening Event Notice"	has the meaning given to it in Section 15.1.2.a.
"Supplemental Indenture"	means the Supplemental Trust Indenture between BE and the BE Trustee, amending and supplementing the Master Indenture, to be entered into in accordance with Section 2.3(e)(i) of Schedule 1 (*Financial Close*).
"Supplied Survey Data"	means the survey data for the Construction Work identified in the Reference Documents.
"Supplier"	means a Subcontractor that primarily provides goods and/or materials, but not services, under the terms of its Subcontract.
"Table 6A.1"	means Table 6A.1 set out in Appendix A to Schedule 6 (*Performance Mechanism*).
"Table 6A.2"	means Table 6A.2 set out in Appendix A to Schedule 6 (*Performance Mechanism*).
"Target"	means, in respect of an Element, the condition of such Element specified in the "Target" column in the Performance and Measurement Tables (as updated in accordance with Schedule 11 (*Operations and Maintenance Requirements*)).
"Tax"	means any Federal, State, local or foreign income, margin, gross receipts, sales, use, excise, transfer, consumer, license, payroll, employment, severance, stamp, business, occupation, premium, windfall profits, environmental (including taxes under Section 59A of the Internal Revenue Code of 1986), customs, permit, capital stock, franchise, profits, withholding, social security (or similar), unemployment, disability, real property, personal property, registration, value added, alternative or add-on minimum, estimated or other tax, levy, impost, duty, fee or charge imposed, levied, collected, withheld or assessed at any time, whether direct or indirect, relating to, or incurred in connection with, the Project, the performance of the Work, the Milestone Payments, Performance Payments, other compensation or act, business, status or transaction of any Developer-Related Entity, including any interest, penalty or addition thereto, in all cases whether disputed or undisputed.
"Technical Deliverable"	means any Deliverable that Developer is required to submit pursuant to Schedules 8 (*Project Administration*), 10 (*Design and Construction Requirements*), 11 (*Operations and Maintenance Requirements*), 12 (*Handback Requirements*), 14 (*Strategic Communications*), 17 (*Environmental Requirements*) and 18 (*Right-of-Way*).
"Technical Panel"	means the dispute resolution panel of such name to be established pursuant to Section 5 of Schedule 25 (*Dispute Resolution Procedure*).
"Technical Proposal Deadline"	means June 1, 2017.
"Technical Requirements"	means the obligations of, and any requirements to be satisfied by, Developer under any of Schedules 8 (*Project Administration*), 9 (*Submittals*), 10 (*Design and Construction Requirements*), 11 (*Operations and Maintenance*), 12 (*Handback Requirements*), 17 (*Environmental*

Requirements) and 18 (*Right-of-Way*) and Table 6A.1 and Table 6A.2.

"Temporary Easement" means any temporary easement in an area that is outside the Right-of-Way or any Additional Right-of-Way, but which is required for performing the Construction Work within the Right-of-Way or any Additional Right-of-Way.

"Temporary ROW Easement" means any temporary easement in an area that is part of the Right-of-Way or any Additional Right-of-Way.

"Temporary Property" means:

a. Temporary Easements; and

b. other areas not within the Right-of-Way or any Additional Right-of-Way in which Developer is performing Work for a temporary period, such as temporary Construction Work sites, lay down areas, staging areas, storage areas, stockpiling areas, earthwork material borrow sites, equipment parking areas and similar areas.

"Temporary Property Rights" means, in respect of any Temporary Property, any right or interest in, or in respect of, such Temporary Property.

"Term" has the meaning given to it in Section 4.2.

"Termination Amount" means, with respect to any termination of this Agreement prior to the Expiry Date, the amount of compensation, if any, owing from the Enterprises to Developer as determined pursuant to this Agreement.

"Termination by Court Ruling" means the issuance of a final, non-appealable court order by a court of competent jurisdiction:

a. to the effect that this Agreement is void and/or unenforceable, or impossible to perform in its entirety;

b. to the effect that either of the Enterprises lacked the authority to execute, deliver and/or perform this Agreement;

c. permanently enjoining or prohibiting performance or completion of a material portion of the Work;

d. requiring the Enterprises or CDOT, individually, or in concert with one another and/or the FHWA, to undertake additional or supplemental evaluations, studies or other work under NEPA or other Law that, in the Enterprises' discretion, is impracticable in light of the purpose and intent of this Agreement; or

e. upholding the binding effect on Developer or the Enterprises and/or CDOT of a Change in Law that causes impossibility of performance of a fundamental obligation by Developer or the Enterprises under this Agreement or impossibility of exercising a fundamental right of Developer or the Enterprises under this Agreement.

"Termination Date" means the effective date of any early termination of this Agreement as determined pursuant to Schedule 1 (*Financial Close*) or Sections 33.1.2 through 33.1.7, as applicable.

"Termination Deduction Amount" means, without double-counting, any:

a. accrued Monthly Construction Closure Deductions, Construction Goal Deductions, Monthly Operating Period

Closure Deductions, Monthly Noncompliance Deductions and Operations Goal Deductions that, as of the Termination Date, have not been taken into account in the calculation of any payment actually made to Developer by the Enterprises prior to the Termination Date; and

b. any other amount that the Enterprises are entitled to set-off against the Termination Amount pursuant to Section 5(a) of Part 3 of Schedule 4 (*Payments*).

"Termination for Convenience" has the meaning given to it in Section 33.1.2.a.

"Termination for Extended Events" has the meaning given to it in Section 33.1.6.a.

"Termination Insurance Proceeds" means all proceeds from insurance payable to Developer under any Available Insurance coverage, or that should otherwise be collectible by Developer from that portion of the Available Insurance that is required to be maintained by Developer pursuant to Section 25 and Schedule 13 (*Required Insurances*), in any such case on or after the Termination Date.

"Termination Notice" means a notice of termination issued pursuant to Section 33.1.

"Test" or "Testing" means the procedure and method of acquiring and recording physical data and comparing it to set standards and submitting a statement to such conditions or operations as will lead to its Acceptance or rejection (deficiency, defective condition, nonconformance) of the item.

"Third Handback Inspection Report" means the report prepared by Developer in accordance with Sections 3.11.a.ii and 3.11.b of Schedule 12 (*Handback Requirements*).

"Third Party Agreements" means:

a. the URAs;

b. the RRAs;

c. the Denver IGA;

d. the E-470 Installation Agreement;

e. the E-470 TSA;

f. the DPS MOA;

g. the Cover Maintenance Agreement; and

h. any agreement that is designated as a Third Party Agreement by the Enterprises in a notice delivered pursuant to Section 8.5.2.a,

in each case as amended or modified pursuant to Section 8.5.2.b.

"Third Party Intellectual Property" means any Intellectual Property used or applied by Developer or any Developer-Related Entity in connection with the Project or the Work which is owned by any Person other than the Enterprises, CDOT or a Developer-Related Entity.

"Third Party Release of Hazardous Substances" means any Release of Hazardous Substances on, in, under, from or in the vicinity of the Site caused by any Person that is not a Developer-Related Entity, either Enterprise or CDOT, which Release:

a. occurs:

i. with respect to any ROW Parcel, after the Setting Date; and

ii. with respect to any Additional ROW Parcel, on or after its Project License Start Date; and

b. is required to be investigated, removed, treated, stored, transported, managed and/or remediated pursuant to Law, any Governmental Approval or Developer's obligations under this Agreement,

excluding any such Release to the extent such results in the presence of Hazardous Substances in groundwater.

"Threshold Zone" means the length of roadway between the Portal and the Transition Zone.

"TIFIA" means the Transportation Infrastructure Finance and Innovation Act of 1998, codified at 23 U.S.C. §§ 601 et seq.

"TIFIA Betterments" means all betterments in a financial term of the TIFIA Financing as compared to the Baseline TIFIA Term Sheet, net of any adverse changes in financial terms as compared to the Baseline TIFIA Term Sheet that are required by the Build America Bureau other than as a condition of accepting a change in terms proposed by Developer or made in response to Developer's financial condition or plan.

"TIFIA Event" means, at any time after the issuance of the Notice of Award, either:

a. the Build America Bureau decides not to, or is unable to, provide credit assistance to Developer:

i. in an amount at least equal to the lesser of:

A. 33% of reasonably anticipated "Eligible Project Costs" (as defined in 23 U.S. Code § 601(a)(2)); or

B. if the TIFIA Loan does not receive an "Investment Grade Rating", the amount of the "Initial Senior Obligations" (as such terms are defined in the Baseline TIFIA Term Sheet),

in each case as determined by reference to the Preferred Proposer's Proposal; or

ii. other than with respect to TIFIA Betterments to the extent such are, in aggregate, positive, on terms materially consistent with the terms of (or, with respect to Key Ratios, identical to or more favorable to Developer than), the Baseline TIFIA Term Sheet; or

b. after the Agreement Date, the Build America Bureau fails to work diligently and reasonably towards achieving Financial Close by the Financial Close Deadline (including unreasonable negotiation),

provided that neither of the events referred to in paragraphs a. or b. of this definition shall be deemed to be a TIFIA Event if:

c. the Preferred Proposer, Developer or any other Developer-Related Entity failed to comply with the requirements of

Section 3.3 of Part B of the ITP or otherwise sought to achieve TIFIA Betterments on its own behalf or on behalf of its Lenders;

d. Developer has failed to use Reasonable Efforts to achieve Financial Close, which Reasonable Efforts shall include:

i. complying with Build America Bureau policy requirements to the extent publicly disclosed or of which Developer is otherwise aware;

ii. negotiating in good faith mutually agreeable terms and conditions with the Build America Bureau, including by making commercially reasonable concessions in connection with concessions by the Build America Bureau; and

iii. furnishing all required information and credit ratings in a timely manner; or

e. such event arises as a result of any breach of Law, Governmental Approval or this Agreement, fraud, willful misconduct, criminal conduct, recklessness, bad faith or negligence by or of the Preferred Proposer or any Developer-Related Entity.

"TIFIA Financing" means any debt financing to be provided by the US DOT pursuant to TIFIA that is assumed in the Base Financial Model.

"TIFIA Loan" means a loan from the US DOT pursuant to the federal credit assistance program established pursuant to TIFIA.

"TIFIA Loan Agreement" has the meaning given to it in Section A of Annex A to the Lenders Direct Agreement entered into on or about the Financial Close Date.

"Tolled Express Lane" means the lanes on the I-70 Mainline where operational strategies are proactively implemented and managed in response to changing conditions.

"Tow Plow" means a snow plow blade mounted on a ballasted trailer that is towed behind a conventional plow or combination plow/spreader truck, where controls in the towing vehicle deploy the tow plow into an adjacent lane, permitting two lanes to be plowed by a single tow vehicle.

"Transferrable Assets" means all Assets, including all transferrable warranties with respect to such Assets, except:

a. any Asset that falls within paragraphs c., d., e. or f. of the definition of Assets in this Part A of Annex A (*Definitions and Abbreviations*) that:

i. is not affixed to any Element, the Right-of-Way or any Additional Right-of-Way; and

ii. to the extent customarily located or used on any part of the Site in connection with the Project:

A. is not owned by Developer;

B. was not purchased by another Developer-Related Entity primarily or exclusively funds received, directly or indirectly, from the Enterprises; and

b. any Temporary Properties, and any buildings located on such properties.

"Transition Zone" means the length of roadway between the Threshold Zone and the Interior Zone and which has variable illumination depending upon the illumination in the Threshold Zone to allow adaption to the Interior Zone illumination, and the length of which is determined by the posted vehicle speed.

"Transportation Commission" has the meaning given to it in the Recitals.

"Transportation Demand Model" means a program that encompasses tools to help with traffic congestion mitigation by offering alternatives to the single occupant vehicle.

"Transportation Management Plan" means, from time to time, the then current plan that satisfies the requirements of Section 2.2.3 of Schedule 10 (*Design and Construction Requirements*) and has been submitted by Developer and Approved by the Department pursuant to Schedule 10 (*Design and Construction Requirements*).

"Travel Time Indicators" means the system of antennas and readers that detect toll tag transponders in vehicles.

"Ultimate" has the same meaning as given to the Preferred Alternative.

"Unavailable Term" means any Insurance Term that, at the time an Insurance Policy is obtained or renewed:

a. is not available to Developer in the worldwide insurance market from Eligible Insurers on terms required by this Agreement; or

b. is not generally being incorporated in insurance procured in the worldwide insurance market from Eligible Insurers by contractors in relation to transportation related infrastructure projects in the United States due to the level of the insurance premium payable for insurance incorporating such Insurance Term,

provided that, for certainty, an Unavailable Term shall not include any risk or peril that is Uninsurable.

"Unexcused Railroad Delay" means:

a. any breach of a RRA by a Railroad; or

b. to the extent not otherwise constituting such a breach:

i. any unexcused delay (as determined by reference to the relevant RRA) by a Railroad in performing any work required to performed by it, or in reviewing or approving any Deliverable for Third Party Review (as such term is defined in Schedule 9 (*Submittals*)) required to be reviewed or approved by it, under the relevant RRA; or

ii. any unreasonable withholding by any Railroad with relevant jurisdiction under the terms of a RRA or otherwise of the issuance or renewal of any Permit necessary for the performance of the Work.

"Unexcused Utility Owner Delay" means:

a. any breach of a URA or Utility Work Order by a Utility Owner; or

b. to the extent not otherwise constituting such a breach:

i. any unexcused delay (as determined by reference to the relevant URA and/or relevant Utility Work Order) by a Utility Owner in performing any work required to be performed by it, or in reviewing or approving any Deliverable for Third Party Review (as such term is defined in Schedule 9 (*Submittals*)) required to be reviewed or approved by it, under the relevant URA and/or Utility Work Order; or

ii. any unreasonable withholding by any Utility Owner with relevant jurisdiction under the terms of a URA or otherwise of the issuance or renewal of any Permit necessary for the performance of the Work,

provided that, for certainty, references in this definition to:

c. any "URA" shall include any Sprint Reimbursement Agreement; and

d. a "Utility Work Order" shall include any Sprint Work Order; and

e. any breach of a Utility Work Order in paragraph a. of this definition shall, as it applies to a Sprint Work Order, mean any failure by Sprint to comply with the terms specified in such Sprint Work Order that apply to Sprint notwithstanding it is not a party to such Sprint Work Order.

"Unexpected Endangered Species" means any animal or plant species listed as threatened or endangered under and subject to an applicable threatened or endangered species Law found at the Right-of-Way, or at any Permit Areas (excluding Developer-risk Permit Areas) in respect of which Developer holds a Permit, the temporary, continual or habitual presence of which on the Right-of-Way or any such Permit Area was not Known or Knowable at the Setting Date.

"Unexpected Geological Conditions" means any subsurface or latent geological conditions encountered at the exact bore hole locations identified in:

a. the boring logs set out in Appendices B and D1 of the Final Preliminary Subsurface Investigation Report I-70 East Corridor Project Partial Cover Lowered Alternative with Managed Lanes Options Brighton Boulevard to Chambers Road Denver, Colorado CDOT Project No: FBR 0709-234 (19631) prepared by Yeh and Associate, Inc. dated September 21, 2015; and

b. the boring logs set out in Appendix C of the Preliminary Subsurface Investigation Report for Partial Cover Lowered (PCL) Alternative I-70 East Corridor EIS CDOT Region 6 prepared by Yeh and Associates, Inc. dated October 31, 2012; and

c. the boring logs set out in Appendix B of the Addendum Final Preliminary Subsurface Investigation Report I-70 East Corridor Project Partial Cover Lowered Alternative with

Managed Lanes Options Brighton Boulevard to Chambers Road Denver, Colorado CDOT Project No: FBR 0709-234 (19631) prepared by Yeh and Associate, Inc. dated June 9, 2016,

in each case that differ materially from those conditions indicated in such boring logs for such bore hole locations, which conditions were not Known or Knowable at the Setting Date.

"Unexpected Governmental Approval Delay" means, in the event that:

a. the Enterprises have complied with their obligations under Section 8.4.4.a; and

b. in order so to comply, the Enterprises were, pursuant to paragraph a. or paragraph b. of the definition of Reasonable Efforts in this Part A of Annex A (*Definitions and Abbreviations*)), not required to take (and did not take) an action necessary to effect issuance, modification, renewal or extension of any Governmental Approval or Permit pursuant to Sections 8.4.4.a.i and/or 8.4.4.a.ii,

any resulting unusual and unreasonable delay by a Governmental Authority in issuing, agreeing to modify, renewing or extending any Governmental Approval or Permit that would have been avoided if the Enterprises had taken the relevant action referred to in paragraph b. of this definition.

"Unexpected Groundwater Contamination Condition" means, in respect of groundwater present in or under any part of the Right-of-Way and any Permit Areas in respect of which Developer holds a Permit (other than any Developer-risk Permit Area) which groundwater is ultimately subject to discharge through any single discharge point pursuant to an applicable Governmental Approval, any Hazardous Substance contamination in such groundwater at concentration levels that are required to be investigated, removed, treated, stored, transported, managed or remediated pursuant to Law or Developer's obligations under this Agreement, as and to the extent such contamination and concentration levels are established at such single discharge point pursuant to Section 23.4.4 of Schedule 17 (*Environmental Requirements*), excluding any such contamination:

a. by a substance identified in the "Chemical Name" column in Appendix C (*Groundwater Benchmark Concentrations*) of Schedule 17 (*Environmental Requirements*) at concentration levels at or below the applicable value set out in the "Value" column in that Appendix C; or

b. to the extent such contamination constitutes a Developer Release of Hazardous Substances.

"Unexpected Groundwater Contamination Event" means:

a. in respect of any single Groundwater Contamination Event Period, the encountering, discovery and/or continued existence (as applicable) of, collectively, all Unexpected Groundwater Contamination Conditions during such period which conditions require temporary treatment or remediation during the Construction Period as part of the performance of the Construction Work; and

b. during both the Construction Period and the Operating

Period the encountering or discovery of, collectively, all Unexpected Groundwater Contamination Conditions which conditions require permanent and ongoing treatment or remediation pursuant to Law or Developer's obligations under this Agreement during the Operating Period and to enable Developer to perform O&M Work After Construction.

"Unexpected Hazardous Substances" means any Hazardous Substances (including soil or surface water contaminated with Hazardous Substances) present on, in or under any part of the Right-of-Way, or any Permit Areas in respect of which Developer holds a Permit, at concentration levels or in quantities that are required to be investigated, removed, treated, stored, transported, managed or remediated pursuant to Law or Developer's obligations under this Agreement, excluding any such Hazardous Substances:

a. present in any groundwater;

b. present in any soil that (for certainty, absent any treatment) meets criteria for reuse, disposal or release on-Site:

   i. under Law;

   ii. pursuant to any Permit or Governmental Approval; or

   iii. in accordance with the Materials Management Plan and the Beneficial Reuse and Materials Management Plan,

   including, for certainty, any such Hazardous Substances that meet such criteria but which cannot be, or are not, reused, disposed of or released on-Site due to:

   iv. there being no available on-Site location to so reuse, dispose of or release such materials; or

   v. any action or decision by or of any Developer-Related Entity;

c. present on, in or under any Developer-risk Permit Area;

d. present in any "Near Surface Soil" (as defined in the Beneficial Reuse and Materials Management Plan) west of Colorado Boulevard;

e. required to be investigated, removed, treated, stored, transported, managed and/or remediated by either Party in complying with its Property Management obligations pursuant to Section 2.2 of Schedule 18 (Right-of-Way);

f. present on or in:

   i. any building, bridge or structure, including any subsurface structure or facility connected to any such building, bridge or structure; or

   ii. any underground storage tank registered with the Colorado Department of Labor and Employment, Division of Oil and Public Safety; or

g. to the extent such constitutes a:

   i. Developer Release of Hazardous Substances;

ii. Enterprise Release of Hazardous Substances; or

iii. Third Party Release of Hazardous Substances.

"Unexpected Historically Significant Remains" means any antiquities (including structures), fossils, coins, articles of value, cultural artifacts, human burial sites and remains and other similar remains of archaeological, historical, cultural or paleontological interest on or under any part of the Right-of-Way, or of any Permit Areas (excluding Developer-risk Permit Areas) in respect of which Developer holds a Permit, which were not Known or Knowable at the Setting Date.

"Unexpected Utility Condition" means any Utility present on the Right-of-Way, or on any Permit Areas (excluding Developer-risk Permit Areas) in respect of which Developer holds a Permit, that was not identified or was incorrectly shown, identified or described in the Utility Data, in each case excluding:

a. any Utility to the extent it was Known or Knowable, which for such purposes shall be deemed to include any Utility that:

i. is located at or less than 10 feet distant from the horizontal centerline indicated therefor in the Utility Data (without regard to vertical location); and/or

ii. has an actual nominal diameter (excluding casings and any other appurtenances) within 12 inches of the size indicated in the Utility Data;

b. any Utility installed on any part of the Right-of-Way after the Project License Start Date, or on any Permit Area after Developer secured a Permit providing access and/or use to or of such area; and

c. any Service Line.

"Unexpected Utility Condition Event" means the encountering or discovery of any Unexpected Utility Condition.

"Uniform Act" means the Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act, P.L. 91-646.

"Uninsurable" means a risk or peril, at the time an Insurance Policy is required to be obtained or renewed:

a. for which Insurance Policies are not available to Developer in the worldwide insurance market from Eligible Insurers on terms required by this Agreement; or

b. that is not generally being insured against in insurance procured in the worldwide insurance market from Eligible Insurers by contractors in relation to transportation-related infrastructure projects in the United States due to the level of the insurance premium payable for insuring such risk.

"unreasonably withheld" has the meaning given to it in Section 2.2.2.a.

"UPRR" means Union Pacific Railroad Company.

"UPRR Crossing" means the existing and/or proposed crossing by the UPRR Railroad through the I-70 East corridor on the Right-of-Way as described in Section 10.1.2 of Schedule 10 (*Design and Construction Requirements*).

"UPRR Pepsi Lead means the existing and/or proposed crossing of Brighton Boulevard by the UPRR Railroad through the I-70 East corridor on the Right-of-Way as

Crossing" described in Section 10.1.3 of Schedule 10 (*Design and Construction Requirements*).

"UPRR RRA" means the railroad agreement with respect to the UPRR Crossing, the UPRR Pepsi Lead Crossing and the UPRR York Street Crossing among CDOT, the City of Denver and UPRR in relation to the Project, a draft of which agreement was provided to the Preferred Proposer as one of the Reference Documents numbered 29.10.10.03.

"UPRR Work" means all duties and services to be furnished and provided by the UPRR as required by the UPRR RRA, as applicable.

"UPRR York Street Crossing" means the existing and/or proposed crossing of York Street by the UPRR Railroad through the I-70 East corridor on the Right-of-Way as described in Section 10.1.4 of Schedule 10 (*Design and Construction Requirements*).

"URA" means:

a. the utility relocation agreements (copies of each of which were provided in the Reference Documents) between CDOT and each of the Publicly Owned Utilities and the Private Utility Owners (other than Sprint); and

b. any Sprint Reimbursement Agreement.

"US DOT" means the United States Department of Transportation.

"Useful Life" means, for an Element, the period following its first construction or installation, or following its last reconstruction, rehabilitation, restoration, renewal or replacement, until the Element will next require reconstruction, rehabilitation, restoration, renewal or replacement.

"Useful Life Baseline Requirement" means, for any Renewal Element, the number of years specified in the "Useful Life" column for such Renewal Element in Appendix B to Schedule 12 (*Handback Requirements*).

"Useful Life Baseline Requirements Table" means the table set out in Appendix B to Schedule 12 (*Handback Requirements*) (as updated in accordance with Section 6.1.4 of Schedule 11 (*Operations and Maintenance Requirements*)).

"User" means any person that is on or about the Project or any portion thereof, or is otherwise making use of the Project for any purpose.

"Utility" means a privately, publicly or cooperatively owned line, facility and/or system for producing, transmitting or distributing communications, cable television, power, electricity, light, heat, gas, oil, crude products, water, steam, waste, or any other similar commodity including:

a. the necessary appurtenances to any such line, facility and/or system; and

b. any Service Line connecting directly to any such line, facility and/or system, regardless of the ownership of such Service Line,

provided that, for certainty, stormwater facilities, irrigation ditches, Intelligent Transportation Systems, Variable Message Signs, video and video detection systems, traffic signals and street lighting shall not constitute "Utilities".

"Utility Betterment"	subject to Section 4.1.4 of Schedule 10 (*Design and Construction Requirements*), has the meaning given to "Betterment" in the applicable URA.
"Utility Data"	means the Utility Drawings, the Utility Matrix, pothole log, manhole tabulation and other Utility information provided in the Reference Documents.
"Utility Drawings"	means the Utility plan design sheets provided in the Reference Documents, as updated from time to time by Developer pursuant to Section 4 of Schedule 10 (*Design and Construction Requirements*).
"Utility Matrix"	means the Construction Work "Utility Matrix" provided in the Reference Documents, as updated from time to time by Developer pursuant to Section 4.3.2.c of Schedule 10 (*Design and Construction Requirements*).
"Utility No-Conflict Close Out Form"	means the form provided in Appendix A of Section 4 to Schedule 10 (*Design and Construction Requirements*).
"Utility Owner"	means the owner of a Utility.
"Utility Permit"	means a Permit issued by CDOT to permit a Utility Owner with a right under Law to have access to the Right-of-Way and any Additional Right-of-Way in order to exercise that right.
"Utility Relocation"	subject to Section 4.1.4 of Schedule 10 (*Design and Construction Requirements*), has the meaning given to "Relocation" in the applicable URA.
"Utility Relocation Standards"	subject to Section 4.1.4 of Schedule 10 (*Design and Construction Requirements*), has the meaning given to "Relocation Standards" in the applicable URA.
"Utility Work"	means any portion of the Construction Work relating to Utility Relocations, Utility Betterments or Requested Relocations, including but not limited to the Activities listed in Section 4.2.9 of Schedule 10 (*Design and Construction Requirements*).
"Utility Work Order"	subject to Section 4.1.4 of Schedule 10 (*Design and Construction Requirements*), has the meaning given to "Work Order" in the applicable URA and shall be substantially in the form provided in Appendix B of Section 4 to Schedule 10 (*Design and Construction Requirements*).
"Variable Message Sign"	means the large dynamic display used for user alerts and notifications.
"Variable Toll Message Sign"	means the static sign with electronic Variable Message Sign inserts that is utilized to display the specific tolls for each segment of the corridor.
"Warrantied Elements"	means the Elements of the Construction Work to be maintained by the applicable Warranty Beneficiaries on and from the Final Acceptance Date (or, in the case of the elements referred to in paragraphs a. and b. of the definition of Cover Top O&M Work in this Part A of Annex A (*Definitions and Abbreviations*), from the end of the Landscape Warranty period (as described in Section 14.11 of Schedule 10 (*Design and Construction Requirements*)) in the areas depicted: a. with respect to the City of Denver as a Warranty Beneficiary, as "Local Agency Operations & Maintenance Work" in Reference Document 29.11.01 and as "Planning Area 2" in the I-70 Cover Plans;

b. with respect to Denver Public Schools as a Warranty Beneficiary, as "Planning Area 1" in the I-70 Cover Plans; and

c. with respect to CDOT as a Warranty Beneficiary, as "Department Operations & Maintenance Work" in Reference Document 29.11.01.

"Warranties"	has the meaning given to it in Section 9.4.1.
"Warranty Beneficiaries"	has the meaning given to it in Section 9.4.2.a.
"Warranty Defects List"	has the meaning given to it in Section 9.4.5.
"Warranty Period"	has the meaning given to it in Section 9.4.3.
"Weekend"	means the 48 hour period commencing on a Saturday at 12.00am and ending on the next Sunday at 11.59pm.
"WDP"	has the meaning given to it in Section 5.1 of Schedule 15 (*Federal and State Requirements*).
"Work"	means all of the work and services and performance of obligations, or any of it, to be undertaken or provided by Developer pursuant to this Agreement, including the Construction Work and the O&M Work.
"Work Breakdown Structure"	means the organized hierarchical division of Activities which shall be the basis for organizing all Work, as described in this Agreement. Requirements for the Work Breakdown Structure are set out in Schedule 8 (*Project Administration*).
"Work Product"	means any document, drawing, report, plan, application, data, work product or other material or information, regardless of form, and including any draft specifically developed by Developer under the terms of this Agreement on or after the Agreement Date (and excluding, for certainty, any Proprietary Intellectual Property and any Third Party Intellectual Property incorporated therein).
"Workforce Development Goals"	has the meaning given to it in Section 6.3 of Schedule 15 (*Federal and State Requirements*).
"Working Day"	means any Calendar Day that is not a Saturday, a Sunday or Holiday.

Part B: Abbreviations

Except as otherwise specified herein or as the context may otherwise require, the following abbreviations set out below are provided as references for purposes of the Technical Requirements, Table 6A.1 and Table 6A.2 only:

"ABC"	means aggregate base course.
"AC"	means alternating current.
"ACL"	means access control list.
"ADA"	means Americans with Disabilities Act.
"AID"	means automatic incident detection.
"AHJ"	means Authority Having Jurisdiction.
"ALPR"	means Automatic License Plate Recognition.
"AMCA"	means Air Movement and Control Association.
"ANSI"	means American National Standards Institute.
"APCD"	means Air Pollution Control Division.
"APEN"	means Air Pollution Emission Notice.
"AREMA"	means American Railway Engineering and Maintenance-of-Way Association.
"ATM"	means Active Traffic Management.
"ATR"	means Automatic Traffic Recorders.
"AVI"	means Automatic Vehicle Identification.
"AVL"	means Automated Vehicle Locator.
"BACR"	means Baseline Asset Condition Report.
"BMP"	means Best Management Practices.
"BRMMP"	means Beneficial Reuse and Materials Management Plan.
"CCD"	means City and County of Denver.
"CCMS"	means Command, Control, and Monitoring System.
"CCP"	means Crisis Communications Plan.
"CCTV"	means Closed Circuit Television.
"CDPHE"	means Colorado Department of Public Health and Environment.
"CDPS"	means Colorado Discharge Permit System.
"CDPS-SCP"	means Colorado Discharge Permit System-Stormwater Construction Permit.
"CFD"	means Computational Fluid Dynamics Model.
"CLOMR"	means Conditional Letter of Map Revision.
"CMS"	means cable management system.
"COTS"	means conventional, off-the-shelf.
"CPCM"	means Construction Process Control Manager.
"CPM"	means Critical Path Method.
"CPW"	means Colorado Parks and Wildlife.
"CRAL"	means Construction of Relocation Acceptance Letter.
"CSL"	means cross sonic log.
"CSP"	means Colorado State Patrol.
"CTMC"	means Colorado Transportation Management Center.
"CTMS"	means Colorado Transportation Management Software.
"CUHP/EPA-SWMM"	means Colorado Urban Hydrograph Procedure/Environmental Protection Agency Storm Water Management Model.
"CWCP"	means Construction Work Communications Plan.
"CWDM"	means coarse wavelength division multiplexing.
"CVS"	means Cover Ventilation System.
"DBE"	means Disadvantaged Business Enterprise.
"DCS"	means Document Control System.
"DPCM"	means Design Process Control Manager.
"DRAL"	means Design of Relocation Acceptance Letter.
"DRIRR"	means Denver Rock Island Railroad.
"DTD"	means Division of Transportation Development.
"DWDM"	means dense wavelength division multiplexing.
"ECS"	means Erosion Control Supervisor.

"ECWP"	means Environmental Compliance Work Plan.
"EDB"	means extended detention basins.
"EDP"	means electrical distribution panels.
"EIS"	means Environmental Impact Statement.
"EM"	means Environmental Manager.
"EPA"	means Environmental Protection Agency.
"ERP"	means Emergency Response Plan.
"ESAL"	means 18-kip Equivalent Single Axle Loads.
"ESB"	means Emerging Small Business.
"ETC"	means Electronic Toll Collection.
"FCM"	means fracture critical member.
"FDAS"	means Fire Detection and Alarm System.
"FDS"	means Functional Design Specification.
"FEE"	means Fee interest or ownership of the fee simple estate in real property.
"FFFS"	means Fixed Firefighting System.
"FMV"	means Fair Market Value.
"GUI"	means graphical user interface.
"GPS"	means Global Positioning System.
"HBP"	means hot bituminous pavement.
"HDPE"	means high-density polyethylene.
"HGL"	means hydraulic grade line.
"HLMR"	means high load multi-rotational.
"HMA"	means hot mix asphalt.
"HOV"	means high occupancy vehicle.
"HVAC"	means heating, ventilation, and air conditioning.
"IA"	means Independent Assurance.
"IAR"	means Interstate Access Request.
"IBC"	means International Building Code.
"IDQM"	means Independent Design Quality Manager.
"IESNA"	means Illumination Engineering Society North America.
"IGMP"	means Internet Group Management Protocol.
"IMP"	means Incident Management Plan.
"IQC"	means Independent Quality Control, which for certainty is the same as "ICQC" as defined in the CDOT Field Materials Manual.
"IQCF"	means the Independent Quality Control firm or function group, as described in Section 6.2.5.b of Schedule 8 (*Project Administration*).
"IQCM"	means Independent Quality Control Manager.
"INWMP"	means Integrated Noxious Weed Management Plan.
"IP"	means Internet Protocol.
"IRI"	means International Roughness Index.
"ISO"	means International Organization for Standardization.
"ITS"	means Intelligent Transportation Systems.
"IVR"	means Interactive Voice Response.
"LCD"	means Liquid Crystal Display.
"LED"	means light emitting diode.
"LEP"	means Limited English Proficient.
"LFD"	means load factor design.
"LFR"	means a load factor rating.
"LOMR"	means Letter of Map Revision.
"LP"	means Lighting Protection.
"LRFD"	means load resistance factor design.
"LRFR"	means aggregate base course.
"LSOH"	means low smoke, zero halogen.
"LUS"	means Lane Use Signal.
"M-E"	means mechanistic-empirical.
"MBTA"	means Migratory Bird Treaty Act.

"MEP" means mechanical, electrical, and plumbing.
"MHCP" means Mile High Courtesy Patrol.
"MHT" means Methods of Handling Traffic.
"MMP" means Materials Management Plan (in the context of Construction Work, and otherwise as the context may provide).
"MMP" means Maintenance Management Plan (in the context of O&M Work).
"MMIS" means Maintenance Management Information System.
"MOCP" means Maintenance and Operations Communications Plan.
"MOT" means maintenance of traffic.
"MVRD" means Microwave Vehicle Radar Detection.
"MS4" means Municipal Separate Storm Sewer System.
"MSE" means mechanically stabilized earth.
"MTIP" means Materials Testing and Inspection Plan.
"MW" means megawatts.
"NCN" means Nonconformance Notice.
"NCHRP" means National Cooperative Highway Research Program.
"NCR" means Nonconformance Report.
"NDRD" means New Development Redevelopment.
"NEC" means National Electric Code.
"NEPA" means the National Environmental Policy Act.
"NFPA" means National Fire Protection Association.
"NIOSH" means National Institute for Occupational Safety and Health.
"NIST" means National Institute of Standards and Technology.
"NSBA" means National Steel Bridge Alliance.
"NTCIP" means National Transportation Communications for ITS Protocol.
"NTP" means Notice to Proceed.
"O&M" means Operations and Maintenance.
"OCR" means Optical Character Recognition.
"OJT" means On the Job Training.
"OMP" means Operations Management Plan.
"OMQMP" means O&M Quality Management Plan.
"OTIS" means Online Transportation Information System.
"PA" means Public Address.
"PC" means Process Control.
"PCCP" means Portland cement concrete pavement.
"PCM" means Project Communications Manager.
"PDA" means Pile Driving Analyzer.
"PE" means Permanent Easement.
"PIARC" means Permanent International Association of Road Congresses.
"PIP" means Public Information Plan.
"PLC" means programmable logic controller.
"PoE" means Power over Ethernet.
"PMP" means Project Management Plan.
"PNS" means Pacific Northwest Snow Fighters.
"POSS" means Point of Slope Selection.
"PQM" means Project Quality Manager.
"PSQF" means Permanent Stormwater Quality Facilities.
"PTFE" means polytetrafloroethylene.
"PTI" means Post-Tensioning Institute.
"PUC" means Public Utility Commission.
"PVC" means polyvinyl chloride.
"QC" means Quality Control.
"QMP" means Quality Management Plan.
"QMS" means Quality Management System.
"QRD" means Quality Records Database.
"RAP" means Recycled Asphalt Pavement.

"REC"	means Recognized Environmental Condition.
"RFC"	means Release for Construction.
"RFP"	means Request for Proposals.
"RHM"	means Recognized Hazardous Material.
"ROD"	means Record of Decision.
"ROW"	means Right-of-Way.
"RPM"	means Reflective Pavement Markers.
"RTD"	means Regional Transportation District.
"RTK"	means Real Time Kinematic.
"RTM"	means Requirements Traceability Matrix.
"RWIS"	means Road Weather Information System.
"SAP"	means Sampling Analysis Plan.
"SB"	means Colorado Senate Bill.
"SCADA"	means Supervisory Control and Data Acquisition.
"SCP"	means Stormwater Construction Permit.
"SFP"	means small form-factor pluggable.
"SMA"	means stone matrix asphalt.
"SMFO"	means Single-Mode Fiber Optic.
"SMP"	means Safety Management Plan.
"SMVMS"	means Side Mounted Variable Message Signs.
"SOLIT"	means Safety of Life in Tunnels.
"SOV"	means single occupancy vehicle.
"SPCC"	means Spill Prevention Control and Countermeasures.
"TCP"	means Temporary Traffic Control Plan.
"TDC"	means Traffic Data Collection Unit.
"TDM"	means Travel Demand Management.
"TE"	means Temporary ROW Easement.
"TMOSS"	means Terrain Modeling Survey System.
"TMP"	means Transportation Management Plan.
"TOP"	means Transportation Operations Plan.
"TSS"	means total suspended solids.
"TTI"	means Travel Time Indicators.
"UBC"	means Uniform Building Code.
"UDFCD"	means Urban Drainage and Flood Control District.
"UE"	means Utility easements.
"UNCC"	means Utility Notification Center of Colorado.
"UPRR"	means Union Pacific Railroad.
"UPS"	means Uninterruptible Power Supply.
"URA"	means Utility Relocation Agreement.
"USFWS"	means U.S. Fish and Wildlife Service.
"VA"	means Voice Alarm.
"VCS"	means ventilation control system.
"VFD"	means Vacuum Fluorescent Display.
"VMS"	means Variable Message Sign.
"VTMS"	means Variable Toll Message Sign.
"WBS"	means a Work Breakdown Structure.
"WDP"	means Workforce Development Plan.
"WQCV"	means Water Quality Capture Volume.

Schedule 1
Financial Close

1. Financial Close Security

1.1 Delivery of Financial Close Security

The Parties acknowledge that, pursuant to Section 7.3.1.f of Part C of the ITP, on or prior to the Agreement Date Developer delivered the Financial Close Security to the Enterprises for the purposes set out in this Schedule 1.

1.2 Maintenance of Financial Close Security

(a) Developer shall monitor the status of each issuer of Financial Close Security as an Eligible Financial Institution or Eligible Surety, as applicable. Developer shall promptly notify the Enterprises if at any time prior to Financial Close any issuer of Financial Close Security ceases to be an Eligible Financial Institution or Eligible Surety, as applicable.

(b) No later than 20 Working Days after Developer becomes aware of such cessation, Developer shall submit to the Enterprises new Financial Close Security issued by an Eligible Financial Institution or Eligible Surety, as applicable that, together with all other outstanding and valid Financial Close Security (if any) issued by one or more Eligible Financial Institutions or Eligible Sureties, as applicable, shall have an aggregate undrawn value of at least . Promptly following the Enterprises' receipt of such Financial Close Security, they shall return to Developer the undrawn portion of the replaced Financial Close Security issued by any issuer that has ceased to be an Eligible Financial Institution or Eligible Surety, as applicable.

1.3 Drawing on Financial Close Security

(a) Developer understands and agrees that the Enterprises will be entitled to draw on the Financial Close Security (up to a maximum amount of) if, and only if:

(i) Developer withdraws, or attempts to withdraw, any part or all of the Financial Close Security without the Enterprises' prior Approval (provided that no such Approval shall be required if Developer terminates this Agreement pursuant to Section 5.2(a) of this Schedule 1);

(ii) Developer fails to comply with Section 1.2(b) of this Schedule 1; or

(iii) the Enterprises have an entitlement to draw on the Financial Close Security pursuant to Section 5.1(b) of this Schedule 1.

(b) The Parties acknowledge and agree that:

(i) forfeiture of the Financial Close Security pursuant to the terms thereof and Section 1.3(a)(i), Section 1.3(a)(ii) (but only to the extent that Section 1.3(b)(ii) of this Schedule 1 does not apply) or Section 1.3(a)(iii) of this Schedule 1:

(A) is in the nature of liquidated damages and not a penalty; and

(B) any amount forfeited is a fair and reasonable estimate of fair compensation to the Enterprises for the work required to procure the Project and any Losses that may accrue to the Enterprises as a result of the circumstances giving rise to such forfeiture, which amounts were impossible to ascertain as of the initial date of the delivery of the Financial Close Security; and

(ii) following any drawing of the Financial Close Security pursuant to the terms thereof and Section 1.3(a)(ii) of this Schedule 1, to the extent this Agreement has not been terminated and the Enterprises do not then have a right to terminate this Agreement pursuant to Section 4.1(a)(ii) or Section 5.1(a) of this Schedule 1, the Enterprises shall return to Developer the cash amount of such drawing

promptly following Developer's cure of any prior failure to comply with Section 1.2(b) of this Schedule 1.

2. Conditions Precedent to Achieving Financial Close

2.1 Occurrence of Financial Close

(a) "Financial Close" will occur upon:

(i) satisfaction (or waiver by the Enterprises) of each of the Developer Conditions Precedent; and

(ii) satisfaction (or waiver by Developer) of each of the Enterprise Conditions Precedent.

(b) Without limiting or otherwise modifying any Party's obligations under this Agreement with respect to Financial Close, no later than three Working Days after the Agreement Date, Developer shall submit to the Enterprises:

(i) for Information, a closing checklist and timeline, identifying all documents, submissions and other actions (whether by or on the part of either Party or any third party) then reasonably anticipated by Developer to be necessary to achieve Financial Close by the Financial Close Deadline; and

(ii) for their consent (such consent not to be unreasonably withheld), a protocol for calculating the Financial Close Base CPP (and, accordingly, the Base MPP) and for calculating the Base Case Equity IRR pursuant to Sections 4 and 5 of Annex A to this Schedule 1 and for determining any other necessary adjustments or amendments to the Financial Model contemplated in Section 2.2(h)(i) of this Schedule 1 and pursuant to Annex A to this Schedule 1 and Section 28.3 of the Project Agreement.

(c) For purposes of Sections 2.2 and 2.3 of this Schedule 1:

(i) any matter that must be "certified" by a Party shall be certified in writing by an authorized representative of such Party, such certification being in form and substance consented to by the other Party (such consent not to be unreasonably withheld); and

(ii) the Parties shall, to the extent practical and without limiting or otherwise modifying either Party's obligations under this Agreement, endeavor to deliver and promptly respond to and comment on documents (including draft documents) necessary to satisfy the conditions precedent to Financial Close in conformity with the closing checklist and timeline referred to in Section 2.1(b)(i) of this Schedule 1 (taking into account the Enterprises' comments on the same).

2.2 Developer Conditions Precedent

Developer shall be responsible for satisfying the following conditions precedent to Financial Close:

(a) on and from the Agreement Date through and including the Financial Close Date, Developer shall have performed and complied with its material obligations under this Agreement, and no Developer Default (or event that, with the passage of time or the giving of any notice, would become a Developer Default) shall have occurred and be continuing on the Financial Close Date;

(b) as of the Financial Close Date, each representation and warranty made by Developer pursuant to Section 5.1.1 of the Project Agreement shall be true and correct as of such date, as certified by Developer;

(c) Developer shall have provided the Enterprises with:

(i) a copy, certified by Developer as true, complete and accurate, of each executed Financing Document that is not also an Enterprise Closing Agreement, each of which shall be in form and substance consented to by the Enterprises (such consent not to be unreasonably withheld); and

(ii) a counterpart of each Enterprise Closing Agreement executed by all parties thereto other than the Enterprises (including other than BE acting as PABs Issuer), each of which shall be in form and substance consented to by the Enterprises (such consent not to be unreasonably withheld);

(d) Developer shall have provided the Enterprises with such documents and certificates as the Enterprises may reasonably request evidencing:

(i) Developer's organization, existence and qualification to do business, including any articles of incorporation, bylaws, partnership agreement, joint venture agreement and/or other appropriate organizational documents and a statement of foreign entity authority, if applicable;

(ii) that all necessary company or partnership action has been taken by Developer to authorize the execution, delivery and performance of each Financing Document and each Enterprise Closing Agreement to which it is a party;

(iii) the authority, power and capacity of the individuals executing the agreements referred to in Section 2.2(d)(ii) of this Schedule 1 on behalf of Developer;

(iv) satisfaction, or waiver, of all conditions precedent to closing and funding the Project Debt under the Financing Documents;

(v) Committed Investments that satisfy the requirements of Section 26.1 of the Project Agreement;

(vi) by reference to the Financial Model and other closing documentation (such as a flow of funds memorandum and/or irrevocable payment instructions), Developer's irrevocable commitment, subject only to the occurrence of Financial Close, to pay the Enterprises (and/or, at the Enterprises' direction, their designee(s)) in such manner and to such accounts as the Enterprises shall, in their discretion, instruct Developer:

(A) pursuant to Section 3.7 of Part B of the ITP; and

(B) all the Enterprises', CDOT's and/or the PABs Issuer's reimbursable fees, costs and expenses associated with the issuance and subsequent administration of any PABs issued in connection with Financial Close pursuant to Section 3.2.2.e of Part B of the ITP, in the final amount notified to Developer by the Enterprises prior to the Financial Close Date; and

(C) all the Enterprises' and/or CDOT's reimbursable fees, costs and expenses associated with the origination, credit processing and administration of any TIFIA Financing undertaken in connection with Financial Close pursuant to Section 3.3.4.d of Part B of the ITP, in the final amount notified to Developer by the Enterprises prior to the Financial Close Date;

(e) Developer shall have delivered to the Enterprises legal opinions to the effect set out in and otherwise compliant with Part C of Schedule 22 (*Forms of Legal Opinions*), which opinions shall otherwise be in form and (subject to reasonable and customary assumptions and qualifications) substance consented to by the Enterprises (such consent not to be unreasonably withheld);

(f) Developer shall have delivered to the Enterprises the Contractor Bonds as required pursuant to Sections 9.3.1.a.i and, if applicable, 9.3.1.c of the Project Agreement;

(g) with respect to all Insurance Policies that are required pursuant to Section 25 of the Project Agreement and Schedule 13 (*Required Insurance*) to be in effect on and from the Financial Close Date:

(i) such policies have been obtained from Eligible Insurers on terms that comply with Section 25 of the Project Agreement and Schedule 13 (*Required Insurance*) and are in full force and effect; and

(ii) the Enterprises shall have received binding verifications of coverage from the relevant insurers (or Developer's insurance brokers) of such Insurance Policies, in compliance with Section 25.3.1 of the Project Agreement as Accepted by the Enterprises; and

(h) on or immediately prior to the anticipated Financial Close Date, Developer shall have delivered to the Enterprises, and the Enterprises shall have consented to (such consent not to be unreasonably withheld):

(i) an unrestricted electronic version of the Financial Model, which version incorporates any amendments previously agreed by the Parties (including to reflect the Financial Close Base CPP), together with an updated "Assumptions Book" (in the form previously submitted by the Preferred Proposer pursuant to Section 6.10.2 of the Financial Proposal Submission Requirements, as defined in the ITP) and with any other documentation necessary or reasonably requested by the Enterprises to operate the Financial Model; and

(ii) an update to the audit report previously submitted by the Preferred Proposer pursuant to Section 6.10.3 of the Financial Proposal Submission Requirements, as defined in the ITP in respect of the Financial Model delivered pursuant to Section 2.2(h)(i) of this Schedule 1, which audit report shall otherwise comply with Section 28.4.1 of the Project Agreement.

2.3 **Enterprises Conditions Precedent**

Without limiting:

(a) BE's obligations as PABs Issuer with respect to the matters set out in paragraph b. of the definition of PABs Event in Part A of Annex A (*Definitions and Abbreviations*) of the Project Agreement; or

(b) Developer's rights under this Schedule 1 following the occurrence of any Key Financial Event,

the Enterprises shall be responsible for satisfying the following conditions precedent to Financial Close:

(c) as of the Financial Close Date, each representation and warranty made by each Enterprise pursuant to Section 5.1.2 of the Project Agreement shall be true and correct as of such date, as certified by the Enterprises;

(d) subject to Developer's delivery to the Enterprises of executed counterparts of each Enterprise Closing Agreement pursuant to Section 2.2(c)(ii) of this Schedule 1, the Enterprises (including BE as PABs Issuer) shall have provided Developer with counterparts of each such Enterprise Closing Agreement executed by one or both Enterprises, as applicable (including, as applicable, execution by the State Controller);

(e) the Enterprises (including BE as PABs Issuer) shall have provided Developer with:

(i) a copy, certified by the Enterprises as true, complete and accurate, of the fully effective (subject only to achievement of Financial Close) Supplemental

Indenture in substantially the form provided to the Preferred Proposer prior to the Final Project Information Date;

(ii) a copy, certified by the Enterprises as true, complete and accurate, of the fully effective (subject only to achievement of Financial Close) IAA in substantially the form provided to the Preferred Proposer prior to the Final Project Information Date; and

(iii) each other customary document, certificate, opinion or undertaking (or, as applicable, a copy of the same certified by the Enterprises as true, complete and accurate) that Developer may reasonably request from either Enterprise (including BE as PABs Issuer) or CDOT as necessary to comply with (A) disclosure requirements under Law and/or (B) customary underwriter requirements, in each case in connection with the issuance of the PABs or any other capital markets issuance; and

(f) the Enterprises shall have provided Developer and the Lenders with legal opinions of the State Attorney General's Office in substantially the forms of Part A and Part B of Schedule 22 (*Forms of Legal Opinions*) to this Agreement.

3. Achievement of Financial Close

3.1 Interest Rate Fluctuation and Benchmarking

Subject to Section 4 of this Schedule 1, pursuant to Annex A to this Schedule 1 the Enterprises shall assume certain Benchmark Interest Rate and/or credit spread fluctuation risks in connection with Financial Close.

3.2 Financial Close Certificate

Upon the occurrence of Financial Close in accordance with Section 2.1(a) of this Schedule 1, the Parties shall sign a certificate in such form as the Parties shall reasonably agree specifying the Financial Close Date.

3.3 Actions Upon Occurrence of Financial Close

Promptly following Financial Close (and, for certainty with respect to Section 3.3(c), on the Financial Close Date):

(a) the Parties shall place the Financial Model and audit report submitted and consented to pursuant to Section 2.2(h) of this Schedule 1 into escrow with the Escrow Agent pursuant to the terms of the Financial Model Escrow Agreement;

(b) the Enterprises shall return the Financial Close Security to Developer; and

(c) BE shall execute and deliver the Central 70 Note to Developer.

4. Key Financial Events

4.1 Parties' rights with respect to Key Financial Events

If a Key Financial Event occurs prior to Financial Close:

(a) the Enterprises may, at any time after such Key Financial Event occurs, in their discretion and by notice to Developer:

(i) take any action pursuant to Section 4.2 of this Schedule 1; or

(ii) with or without first taking (or after taking) any action pursuant to Section 4.2 of this Schedule 1, terminate this Agreement subject to prior notice, in which case Section 4.4 of this Schedule 1 shall apply; and

(b) Developer may terminate this Agreement by notice if, and only if, Developer has a right to terminate pursuant to Section 5.2(a) of this Schedule 1.

4.2 **Mitigation of a Key Financial Event prior to Financial Close**

If a Key Financial Event has occurred, the Enterprises may, in their discretion, take any one or more of the following actions as applicable with respect to such Key Financial Event:

(a) agree to an increase to the Base CPP, including to an amount that would result in an upward adjustment to the Base MPP of more than 10%;

(b) with the agreement of Developer and, as necessary, the Lenders, agree to lower the amount and/or timing of the Committed Investments otherwise required in order to comply with Section 26.1 of the Project Agreement;

(c) require Developer to introduce alternative sources of debt for Project Debt relative to those set out in the Base Financial Model, in which case, the Enterprises may require Developer to conduct a timely, transparent financing competition to identify and arrange for the lowest-priced alternative debt financing commercially available on terms reasonable satisfactory to Developer and Approved by the Enterprises, provided that Developer shall be entitled to recover from the Enterprises the reasonably incurred and documented costs and expenses associated with conducting such a funding competition;

(d) in connection with any Key Financial Event of a type referred to in paragraphs d., e. or f. of the definition thereof in Part A of Annex A (*Definitions and Abbreviations*) of the Project Agreement, the Enterprises may in their discretion and upon prior notice extend the Financial Close Deadline (one or more times, provided that the aggregate such extension shall not exceed 180 Calendar Days) and Developer shall correspondingly extend the expiration date of the Financial Close Security (subject to Sections 4.2(d)(ii), 5.1(c) and 5.2(b) of this Schedule 1, at Developer's cost and expense) to occur no earlier than the 10th Working Day following the extended Financial Close Deadline, provided that as a condition to such extensions of the Financial Close Deadline and of the expiration date of the Financial Close Security, the Enterprises shall agree to:

(i) an increase (if any) to the Base CPP and/or the Milestone Payments (the election being at the Enterprises' discretion) to reflect indexation of the Construction Price, such that the Construction Price will be adjusted by applying the following formula:

$$Price_{new} = Price_{old} \times (1 + (((CCI_{new}-CCI_{old})/CCI_{old})*(D/M)))$$

Where:

(A) $Price_{new}$ is the adjusted Construction Price;

(B) $Price_{old}$ is the unadjusted Construction Price (being the amount set out in the definition thereof in Part A of Annex A (*Definitions and Abbreviations*) of the Project Agreement);

(C) CCI_{new} is the value for the ENR Construction Cost Index most recently published by Engineering News-Record prior to the Financial Close Date;

(D) CCI_{old} is the value for the ENR Construction Cost Index most recently published by Engineering News-Record prior to the Financial Close Deadline in effect immediately prior to such extension;

(E) *D* is the number of Calendar Days in the period from (but excluding) the Financial Close Deadline in effect immediately prior to such extension to (and including) the Financial Close Date; and

(F) *M* is the total number of Calendar Days from (but excluding) the date of issuance of CCI_{old} to (and including) the date of issuance of CCI_{new},

provided that, if CCI_{new} is less than or equal to CCI_{old}, then (x) no calculation shall be carried out, (y) $Price_{new}$ shall be deemed to be equal to $Price_{old}$ and (z) no adjustments shall be made to the Base CPP and/or the Milestone Payments pursuant to this Section 4.2(d)(i);

(ii) an increase to the Base CPP and/or the Milestone Payments (the election being at the Enterprises' discretion) to compensate Developer for the lesser of:

(A) its reasonable and documented costs and expenses (including, for certainty, the cost and expense of extending the expiration date of the Financial Close Security) incurred in connection with its efforts to achieve Financial Close from (but excluding) the Financial Close Deadline in effect immediately prior to such extension; and

(B) ; and

(iii) an adjustment to the protocol previously consented to by the Enterprises pursuant to Section 2.1(b)(ii) of this Schedule 1 (which prior protocol shall, for certainty, remain in effect in the event that Financial Close occurs on or prior to the Financial Close Deadline in effect immediately prior to such extension) such that:

(A) for purposes of Section 3(a) and 3(b) of Annex A to this Schedule 1, the Enterprises shall bear the risk and have the benefit of 100% (and not, for certainty, 85%) of the impact (either positive or negative) of changes in credit spreads for any Bond Financing (excluding any private placement that is not also an offering under Rule 144A and Regulation S of the Securities Act of 1933) as otherwise provided for in Sections 1 and 4 of Annex A to this Schedule 1 (including as such Section 4 shall be deemed to be revised pursuant to Section 5 of Annex A to this Schedule 1); and

(B) the Enterprises shall bear the risk and have the benefit of:

(I) 100% of changes in credit spreads for any Bond Financing comprised of a private placement that is not also an offering under Rule 144A and Regulation S of the Securities Act of 1933; and

(II) [*Reserved.*],

provided that:

(III) as a condition to the Enterprises bearing such risk, Developer shall use Reasonable Efforts to extend its existing Lender commitments with respect to any such Bond Financing on its original terms; and

(IV) if, after the use of such Reasonable Efforts, Developer is unable to extend such commitments, or is only able to obtain extended commitments on terms that differ materially (and adversely to Developer, and therefore to the Enterprises, such determination to be made by the Enterprises in their discretion), then the Enterprises may, in accordance with and subject to Section 4.2(c) of this Schedule 1, require Developer to introduce alternative sources of debt for Project Debt; and/or

(e) take any other action as may be proposed by any Party and mutually agreed among all the Parties.

4.3 **Successful mitigation of a Key Financial Event**

If, following the occurrence of a Key Financial Event, either:

(a) subject to Section 5.2(c) of this Schedule 1, the Enterprises take any one or more actions pursuant to Section 4.2 of this Schedule 1; or

(b) following the Enterprises' election to terminate this Agreement pursuant to Section 4.1(a)(ii) of this Schedule 1, Developer delivers a notice pursuant to Section 4.4 of this Schedule 1 and, only with respect to any such notice delivered pursuant to Section 4.4(b) of this Schedule 1, Developer concluded (prior to the end of the period of suspension of Enterprises' notice of termination pursuant to Section 4.4(b) of this Schedule 1) a financing competition that identified and arranged a debt financing solution that is consented to by the Enterprises (such consent not to be unreasonably withheld),

then, to the extent applicable:

(c) if requested by Developer (and to the extent the Enterprises have not previously extended the Financial Close Deadline pursuant to Section 4.2(d) of this Schedule 1) the Enterprises shall extend the Financial Close Deadline to the extent reasonably necessary, provided that Developer correspondingly extends the expiration date of the Financial Close Security to occur no earlier than the 10th Working Day following the extended Financial Close Deadline; and

(d) this Agreement shall be amended (in a manner to be agreed among the Parties) to reflect any relevant action taken by the Enterprises as referred to in Section 4.3(a) of this Schedule 1 or, as the case may be, the results of any such financing competition that identified and arranged a debt financing solution that is consented to by the Enterprises (such consent not to be unreasonably withheld).

4.4 **Enterprise Election to terminate due to a Key Financial Event**

If the Enterprises make an election to terminate this Agreement pursuant to Section 4.1(a)(ii) of this Schedule 1, then, except to the extent expressly provided otherwise in Section 5.3 of this Schedule 1, this Agreement shall terminate in its entirety upon 15 Working Days' prior notice to Developer, provided that, with respect to any such election to terminate following the occurrence of a Key Financial Event of the type defined in paragraphs a., b. or c. of the definition thereof in Part A of Annex A (*Definitions and Abbreviations*) of the Project Agreement, the Enterprises shall suspend their notice of termination if, within 10 Working Days after delivery of such notice to Developer, Developer notifies the Enterprises that:

(a) Developer irrevocably and unconditionally agrees that any increase in the Base CPP that would otherwise apply as a result of an adjustment pursuant to Annex A to this Schedule 1 or Section 4.2(a) of this Schedule 1 would be capped such that the resulting upward adjustment to the Base MPP would not exceed 10% where it would otherwise exceed such percentage and, as a result, would result in the occurrence of the Key Financial Event specified in paragraph b. of the definition thereof in Part A of Annex A (*Definitions and Abbreviations*) of the Project Agreement; or

(b) Developer shall, at its own initiative, conduct a timely, transparent financing competition equivalent to that described in Section 4.2(c) of this Schedule 1 in order to address a Key Financial Event occurring in relation to a PABs Event or TIFIA Event, provided that, if Developer notifies the Enterprises pursuant to this Section 4.4(b), any resulting suspension of Enterprises' notice of termination pursuant to this Section 4.4 shall end on the earliest of:

(i) the unsuccessful conclusion of such financing competition without identifying and arranging a debt financing on terms reasonable satisfactory to Developer and that is otherwise consented to by the Enterprises (such consent not to be unreasonably withheld);

(ii) the successful conclusion of such financing competition with the identification and arrangement of a debt financing solution that is on terms reasonable satisfactory to Developer and that is otherwise consented to by the Enterprises (such consent not to be unreasonably withheld) (at which time such notice of termination will be deemed void);

(iii) 60 Calendar Days after the date on which Developer notified the Enterprises pursuant to this Section 4.4(b); and

(iv) the Financial Close Deadline.

5. **Termination prior to Financial Close**

5.1 **Termination by the Enterprises**

(a) If any Developer Condition Precedent is not satisfied (or waived) by the Enterprises as of the Financial Close Deadline, the Enterprises may in their discretion, after the Financial Close Deadline, terminate this Agreement by notice with immediate effect.

(b) If the Enterprises terminate this Agreement pursuant to Section 5.1(a) of this Schedule 1, then upon such termination becoming effective, and unless Developer has been excused from its obligation to achieve Financial Close by the Financial Close Deadline pursuant to Section 5.2(c) of this Schedule 1, the Enterprises may in their discretion draw on, and retain the proceeds of, the Financial Close Security pursuant to Section 1.3 of this Schedule 1 (and, for certainty, the Enterprises shall have no obligation to pay the Financial Close Termination Amount to Developer).

(c) In the event that the Enterprises terminate this Agreement pursuant to Section 4.1(a)(ii) of this Schedule 1, the Enterprises shall pay the Financial Close Termination Amount to Developer no later than 60 Calendar Days following such termination.

5.2 **Termination by Developer**

(a) If either:

(i) as of the Financial Close Deadline:

(A) each Developer Condition Precedent has been satisfied or waived (or, to the extent unsatisfied, remains unsatisfied as a direct result of (I) the Enterprises' failure to comply with their obligations to provide assistance to Developer pursuant to Section 27.4.1 of the Project Agreement, which failure Developer has been unable to mitigate through Reasonable Efforts or (II) the continuation of a Key Financial Event as of the Financial Close Deadline that falls within paragraphs d., e. or f. of the definition of Key Financial Event in Part A of Annex A (*Definitions and Abbreviations*) of the Project Agreement); and

(B) any Enterprise Condition Precedent has not been satisfied and has not been waived; or

(ii) a Key Financial Event occurs prior to Financial Close and:

(A) the Enterprises have notified Developer that they will not take any action, or will cease to take any action, pursuant to Section 4.2 of this Schedule 1;

(B) the Enterprises have taken action pursuant to Sections 4.2(a), 4.2(b), 4.2(c), 4.2(d)(iii)(B)(IV) and/or 4.2(e) of this Schedule 1 but, after taking into account any effect of such action (and unless Developer has agreed otherwise pursuant to Section 4.2(e) of this Schedule 1) any of the Key Ratios and/or the Equity IRR would be less than that Key Ratio or Equity IRR, as the case may be, would have been had the relevant Key Financial Event not occurred; or

(C) the Enterprises have not, within 15 Calendar Days of receiving a written request from Developer (or, if earlier, by the Financial Close Deadline if it occurs following such a written request) notified Developer of their intent to take any action pursuant to Section 4.2 of this Schedule 1,

then Developer shall have the right to terminate this Agreement by notice to the Enterprises with immediate effect, following which the Enterprises shall return the Financial Close Security to Developer in the City of Denver within two Working Days.

(b) In the event that Developer terminates this Agreement pursuant to Section 5.2(a) of this Schedule 1, the Enterprises shall pay the Financial Close Termination Amount to Developer no later than 60 Calendar Days following such termination.

(c) Unless the Enterprises otherwise terminate this Agreement pursuant to either Section 4.1(a)(ii) or Section 5.1(a) of this Schedule 1, Developer's obligation to achieve Financial Close by the Financial Close Deadline shall be excused if, and only if it has a right to terminate this Agreement pursuant to Section 5.2(a) of this Schedule 1.

5.3 **Consequences of Termination**

If this Agreement is terminated pursuant to this Schedule 1, neither Party shall have any obligation or liability to the other Party, except:

(a) any Enterprise entitlement to draw on the Financial Close Security pursuant to this Schedule 1;

(b) any Enterprise obligation to pay the Financial Close Termination Amount to Developer pursuant to Section 5.1(c) or Section 5.2(b) of this Schedule 1;

(c) with respect to any antecedent breach of this Agreement; and

(d) as provided for in Section 41 of the Project Agreement.

Annex A
Interest Rate and Credit Spread Fluctuation Risk Sharing

1. Changes in Financing Terms

The Enterprises reserve the right to Approve any changes in Benchmark Interest Rates or in the debt structure (e.g., fixed or variable rate, bank financing or bond financing, call provisions) that are proposed to be made at or prior to Financial Close to the extent that any such change constitutes a deviation from the assumptions in the Base Financial Model.

2. Market Interest Rate Protection

Subject to the Parties' rights pursuant to Section 4.1 of Schedule 1 following the occurrence of a Key Financial Event, pursuant to Section 4 of this Annex A the Enterprises shall bear the risk and have the benefit of 100% of the impact (either positive or negative) on the Base CPP of changes in any applicable Benchmark Interest Rates over the applicable Protection Period with respect to any Bond Financing and/or TIFIA Financing.

3. Credit Spread Fluctuation Risk Protection

(a) Subject to (I) Section 3(b) of this Annex A, (II) the Parties' rights pursuant to Section 4.1 of Schedule 1 following the occurrence of a Key Financial Event, and (III) adjustment pursuant to Section 4.2(d)(iii) of Schedule 1, pursuant to Section 4 of this Annex A the Enterprises shall bear the risk and have the benefit of 85% of the impact (either positive or negative) on the Base CPP of the differences between:

(i) the Baseline Credit Spreads; and

(ii) the credit spreads for any Bond Financing (excluding any private placement that is not also an offering under Rule 144A and Regulation S of the Securities Act of 1933) as of the last day of the applicable Protection Period, excluding any increases in credit spreads in respect of bonds that are part of any Bond Financing resulting from the final credit rating of such bonds being lower than the indicative investment grade rating(s) of such bonds provided in the Preferred Proposer's Proposal.

(b) To the extent that Section 5 of this Annex A applies, the amount of the risk and benefit borne by the Enterprises of the impact (either positive or negative) on the Base CPP of changes in the credit spreads referred to in Section 3(a)(ii) of this Annex A shall be determined by application of the principles set out in Section 5(b) of this Annex A.

(c) For certainty, Developer will bear the risk and have the benefit of 100% of the impact (either positive or negative) of the movements in margins associated with any commercial bank financing, including bank lender margins and swap credit margins.

4. Base MPP Update Protocol

The Parties shall use the Base Financial Model to calculate the changes contemplated by Sections 2 and 3 of this Annex A, positive or negative, in the Base CPP. The Parties shall make such calculation and produce the Financial Model to be delivered pursuant to Section 2.2(h)(i) of Schedule 1 by taking the following steps, and otherwise pursuant to the protocol consented to by the Enterprises pursuant to Section 2.1(b)(ii) of Schedule 1 (as such may subsequently be adjusted pursuant to Section 4.2(d)(iii) of Schedule 1).

(a) *First*, the Base Financial Model shall be run to solve for a "preliminary adjusted" Base CPP, inputting only:

(i) the actual Financial Close Date and amendments to the Baseline Substantial Completion Target Date and Milestone Completion Target Dates in each case to reflect, on a day for day basis, any delay in achieving Financial Close relative to November 30, 2017 (being the Financial Close Date assumed in the ITP); and

(ii) in the event that the Enterprises extend the Financial Close Deadline pursuant to Section 4.2(d) of Schedule 1, for increases in costs permitted pursuant to Sections 4.2(d)(i) and 4.2(d)(ii), including any associated adjustments to the Milestone Payments made pursuant thereto,

in each case holding the Preliminary Equity IRR constant. As part of this process the Base Financial Model shall be solved for the lowest possible change in the Base CPP that does not result in a breach of any of the Key Ratios.

(b) *Second*, the interim Financial Model resulting from the step described in Section 4(a) of this Annex A shall be run to solve for a "first adjusted" Base CPP, inputting only the TIFIA Betterments and holding the Preliminary Equity IRR constant. As part of this process the Base Financial Model shall be solved for the lowest possible change in the Base CPP that does not result in a breach of any of the Key Ratios.

(c) *Third,* a "second adjusted" Base CPP shall be calculated as follows:

(i) the "preliminary adjusted" Base CPP; *minus*

(ii) 85% of the difference between the "preliminary adjusted" Base CPP and the "first adjusted" Base CPP.

(d) *Fourth,* the interim Financial Model resulting from the step described in Section 4(b) of this Annex A shall be run to solve for the Equity IRR (which shall be the "TIFIA Adjusted Preliminary Equity IRR" for purposes of this Section 4 of this Annex A) that results from inputting the "second adjusted" Base CPP.

(e) *Fifth*, the interim Financial Model resulting from the step described in Section 4(d) of this Annex A, shall be run to solve for a "first interim" Base CPP, inputting only the changes, if any, in Benchmark Interest Rates as described in Section 2 of this Annex A, and changes, if any, in the coupon rates applicable to a Bond Financing (such changes to be determined in accordance with the following paragraph of this Section 4(e)), and holding the "TIFIA Adjusted Preliminary Equity IRR" calculated pursuant to Section 4(d) of this Annex A constant. In addition, as part of this process the Base Financial Model shall be solved for the lowest possible change in the "second adjusted" Base CPP that does not result in a breach of any of the Key Ratios.

The Enterprises shall capture a portion of changes, if any, in coupon rates applicable to a Bond Financing through the model run under this Section 4(e) and the remainder of any such changes in coupon rates through the model run under Section 4(f) of this Annex A. The allocation between the model runs under this Section 4(e) and Section 4(f) of this Annex A for the changes in coupon rates (if any) will be determined in proportion to the overall change in Benchmark Interest Rates and credit spreads (relative to the Baseline Credit Spreads). By way of example only, if Benchmark Interest Rates increase 50bps, credit spreads increase 25bps, and the coupon rate increases 30bps, 20bps of the change in the coupon rate will be run under this Section 4(e) and the other 10bps change in the coupon rate will be run under Section 4(f) of this Annex A. As another example, if Benchmark Interest Rates decrease 20bps, credit spreads increase 30bps, and the coupon rate increases 5bps, -10bps of the change in the coupon rate will be run under Section 4(e) and 15bps change in the coupon rate will be run under Section 4(f) of this Annex A.

(f) *Sixth*, the interim Financial Model resulting from the step described in Section 4(e) of this Annex A shall be run to solve for a "second interim" Base CPP, inputting only the changes, if any, in credit spreads for any Bond Financing as described in Section 3(a) of this Annex A and in the coupon rates applicable to a Bond Financing, and holding the "TIFIA Adjusted Preliminary Equity IRR" calculated pursuant to Section 4(d) of this Annex A constant. In addition, as part of this process the Base Financial Model shall be solved for the lowest possible change in the "first interim" Base CPP that does not result in a breach of any of the Key Ratios.

(g) *Seventh*, an amended Base CPP (the "Financial Close Base CPP") shall be calculated as follows:

Financial Close Base CPP = Base CPP^{First} + (85% x (Base CPP^{Second} - Base CPP^{First})

where:

Base CPP^{First} = the first interim Base CPP resulting from the step described in Section 4(e) of this Annex A

Base CPP^{Second} = the second interim Base CPP resulting from the step described in Section 4(f) of this Annex A

(h) *Eighth*, the interim Financial Model resulting from the step described in Section 4(f) of this Annex A shall be run to solve for the Base Case Equity IRR, inputting:

(i) the Financial Close Base CPP; and

(ii) to the extent applicable, all other changes in the terms of the financing between those assumed and indicated in the Base Financial Model and those set out in or otherwise applicable under the terms of the Financing Documents as of the Financial Close Date.

5. Preferred Proposer Basis Scale Adjustment

(a) The Parties acknowledge and agree that the "Proposer Basis Scale" submitted by the Preferred Proposer pursuant to Section 6.6 of the Financial Proposal Submission Requirements as defined in the ITP included, in some but not all cases, credit spreads that were less than those reflected in the basis yield curve and set of baseline credit spreads previously issued to it by the Enterprises pursuant to Section 4.2.3.c.ii. of Part C of the ITP (any such lesser credit spreads submitted by the Preferred Proposer, "Preferred Proposer Credit Spreads").

(b) Therefore, the protocol to be submitted by Developer pursuant to Section 2.1(b)(ii) of this Schedule 1 shall include the protocol for calculating the Financial Close Base CPP (and, accordingly, the Base MPP) and for calculating the Base Case Equity IRR with respect to each actual Baseline Credit Spread for which there is a Preferred Proposer Credit Spread and for the purposes thereof Section 4 of this Annex A shall be deemed to be revised to reflect the following, in each case as applied separately to each tranche / maturity of the Project Debt and with respect to each actual Baseline Credit Spread for which there is a Preferred Proposer Credit Spread:

(i) if any actual credit spread exceeds the relevant Baseline Credit Spread, Developer shall only be entitled to credit spread projection for the actual credit spread above the Baseline Credit Spread (with the difference between the Preferred Proposer Credit Spread and the Baseline Credit Spread being Developer's risk);

(ii) if any actual credit spread exceeds the relevant Preferred Proposer Credit Spread but is less than or equal to the relevant Baseline Credit Spread, Developer shall not be entitled to any credit spread protection; and

(iii) if any actual credit spread is equal to or less the relevant Preferred Proposer Credit Spread, Developer and the Enterprises shall share credit spread fluctuation risk 15%/85% relative to the Preferred Proposer Credit Spread.

(c) The following worked examples are provided as examples only of the application of Section 5(b) of this Annex A:

	Preferred Proposer Credit Spreads (bps)	Common Credit Spreads (bps)	Actual Credit Spreads (bps)	Risk Sharing
Scenario 1	100	150	200	Developer bears risk on 100% of movements in spreads from 100bps to 150bps. 85/15 risk sharing calculated on movement in spreads from 150bps to 200bps. Calculations to account for Developer bearing 100% of the risk of movements in spreads from 100bps to 150bps.
Scenario 2	100	150	125	Developer bears risk on 100% of movements in spreads from 100bps to 125bps.
Scenario 3	100	150	75	85/15 risk sharing calculated on movement in spreads from 100bps to 75bps.

Schedule 2
Representations and Warranties

Part A: Representations and Warranties of Developer

(a) **Organization; Power and Authority**. Developer:

(i) is a limited liability company, duly formed, validly existing and in good standing in accordance with the laws of the State of Delaware;

(ii) is authorized to transact business in, and is registered with the Secretary of State in, the State; and

(iii) has the limited liability company power and authority to:

(A) transact the business that it transacts and proposes to transact pursuant to the Project Agreement; and

(B) execute, deliver and perform the Project Agreement, each Principal Subcontract and each other Subcontract and each Financing Document and Enterprise Closing Agreement to which Developer is a party (collectively, the "Developer Agreements").

(b) **Authorization and Due Execution**.

(i) Each Person executing any Developer Agreement on behalf of Developer has been (or, at the time of execution, will have been) duly authorized to execute and deliver such document on behalf of Developer.

(ii) The execution, delivery and performance of each Developer Agreement by Developer has otherwise been duly authorized by all necessary limited liability company action of Developer.

(iii) Each Developer Agreement has been (or, at the time of execution and delivery, will have been) duly and validly executed and delivered by Developer.

(c) **Enforceability**. Each Developer Agreement constitutes (or, at the time of execution and delivery, will constitute) a legal, valid and binding obligation of Developer, enforceable against Developer and, if applicable, each Equity Member holding an interest in Developer, in accordance with its terms, subject only to applicable bankruptcy, insolvency and similar laws affecting the enforceability of the rights of creditors generally and general principles of equity.

(d) **No Conflicts**. The execution, delivery and performance by Developer of any Developer Agreement does not and will not contravene any:

(i) Law applicable to Developer that is in effect on the date of execution and delivery of each Developer Agreement;

(ii) organizational, corporate or other governing documents of Developer; or

(iii) agreement, instrument, Governmental Approval, judgment or decree to which Developer is a party or is bound.

(e) **Consents and Approvals**.

(i) Prior to the Agreement Date, Developer familiarized itself with the requirements of any and all Laws, including Laws applicable to the use of Federal funds, and the conditions of any Governmental Approvals or Permits necessary to perform its obligations under the Project Agreement at the time and in the manner required.

(ii) As of the date on which this representation and warranty is given or repeated, Developer has acquired any and all Governmental Approvals and Permits:

(A) that Developer is required to obtain pursuant to the Project Agreement; and

(B) that are necessary to perform those of its obligations under the Project Agreement that fall due for performance on or immediately following such date such that Developer is not and will not be in breach of Section 8.4.2.a. of the Project Agreement,

and, as of such date, all such Governmental Approvals and Permits are in full force and effect.

(iii) Developer has no reason to believe that any Governmental Approval or Permit that Developer is required to obtain pursuant to the Project Agreement will not be granted in due course and thereafter remain in effect so as to enable the Work to proceed in accordance with the Project Agreement.

(f) **Developer Default**. No Developer Default has occurred and is continuing, and no fact or event exists that with the passage of time or giving of notice would constitute a Developer Default.

(g) **Applicable Law**. Developer is not in breach of any Law that would have a material adverse effect on the Work or the performance of any of its obligations under the Developer Agreements.

(h) **Due Diligence; Reasonable Investigation**.

(i) The statements set out in Sections 3.1.a, 3.1.b and 3.2.1 of the Project Agreement are true and accurate.

(ii) On the basis of:

(A) the due diligence conducted by the Preferred Proposer and the Developer-Related Entities as referred to in Sections 3.1.b and 3.2.1 of the Project Agreement; and

(B) subsequent such diligence of the Project, the Project Information and the Site as has been conducted by Developer,

and taking into account the terms of the Project Agreement and Developer's rights thereunder, Developer:

(C) is familiar with and accepts the physical requirements of the Work;

(D) has evaluated all the constraints affecting design and construction of the Project and has reasonable grounds for believing and believes that the Project can be designed and built within such constraints; and

(E) has obtained for itself all necessary information regarding the risks, contingencies and other circumstances which may influence or affect its ability to perform its obligations under the Project Agreement and any other factors which would affect its decision to enter the Project Agreement or the terms on which it would do so.

(i) **Financial Model**.

(i) The Financial Model:

(A) was prepared by or on behalf of Developer in good faith;

(B) was audited by an independent recognized model auditor immediately before the Agreement Date in compliance with the engagement terms previously approved by the Procuring Authorities in accordance with Section 4.4.3 of Part C of the ITP;

(C) fully discloses all financial assumptions and projections that Developer has used or is using in making its decision to enter into this Agreement and in making disclosures to rating agencies, potential equity investors and Lenders;

(D) includes only formulas that are:

(I) mathematically correct and suitable for making the projections referred to in paragraph (i)(i)(E) of this Part A; and

(II) the same financial formulas that Developer utilized and is utilizing in the Financial Model in making its decision to enter into the Project Agreement and in making disclosures to rating agencies, potential equity investors and Lenders; and

(E) represents the projections that Developer believes in good faith are the most realistic and reasonable for the Project as of the date on which this representation and warranty is given or repeated, provided that such projections:

(I) are based upon a number of estimates and assumptions;

(II) are subject to significant business, economic and competitive uncertainties and contingencies; and

(III) accordingly, are not a representation or warranty that any of the assumptions are correct, that such projections will be achieved or that the forward-looking statements expressed in such projections will correspond to actual results.

(ii) Developer has reviewed all Law relating to Taxes, and has taken into account all requirements imposed by relevant Law in preparing the Financial Model.

(j) **Legal Proceedings**. There is no:

(i) criminal, civil, enforcement or other action, suit, proceeding, investigation or litigation pending or served on or against Developer or any Equity Member that:

(A) challenges Developer's authority to execute, deliver or perform any Developer Agreement;

(B) challenges the validity or enforceability of any Developer Agreement;

(C) challenges the authority of any Developer representative executing any Developer Agreement; or

(D) could reasonably be expected to have a material and adverse effect on the ability of Developer to perform its obligations under any Developer Agreement; and

(ii) un-served or threatened action, suit, proceeding, investigation or litigation against Developer or any Equity Member with respect to any of the matters referred to in paragraphs (j)(i)(A) to (D) of this Part A of which Developer is aware and has not previously disclosed in writing to the Enterprises.

(k) **Prohibited Acts**. Developer has not, and, to the best of Developer's knowledge and belief (Developer having made reasonable enquiries with a view to obtaining such knowledge and belief) no Developer-Related Entity has, committed any Prohibited Act.

(l) **Organizational Conflicts of Interest**. As of the Financial Proposal Deadline, the Preferred Proposer disclosed to the Enterprises in writing all Organizational Conflicts of Interest of which Preferred Proposer was aware and, since such date, Developer has not obtained knowledge (Developer having made reasonable inquiries with a view to obtaining such knowledge) of any additional Organizational Conflict of Interest, and there have been no Organizational Changes or Key Personnel Changes (as such terms are defined in the ITP) to or by Developer or its Principal Subcontractors identified in its Proposal which require approval by the Enterprises pursuant to the terms of the ITP and have not been so approved.

(m) **Debarment**. None of Developer, any of its principals or any of its Principal Subcontractors are presently disqualified, suspended or debarred from bidding, proposing or contracting with any state-level, interstate or Federal Governmental Authority. For purposes of this representation and warranty, the term "principal" means an officer, director, Equity Member or other direct or indirect owner, partner, Key Personnel, employee or other person with primary management or

supervisory responsibilities, or a person who has a critical influence on or substantive control over the operations of Developer.

(n) **Taxes and Fees**. Neither Developer nor any of its Equity Members is presently in arrears in payment of Taxes, Permit fees or other statutory, regulatory or judicially required payments to the Enterprises, CDOT or the State or, with respect to Taxes or judicially required payments only, to any other state or the Federal Government, except with respect to any State, other state or Federal Taxes, to the extent such are being contested in good faith and by appropriate proceedings for which adequate reserves have been established in accordance with GAAP.

(o) **Principal Subcontractors**. As of the effective date of the relevant Principal Subcontract:

(i) each of the Construction Contractor and the O&M Contractor (each such Principal Subcontractor, a "Relevant Entity"):

(A) is duly organized, validly existing and, where legally applicable, in good standing under the laws of the state of its organization; and

(B) is authorized to transact business in, and is registered with the Secretary of State in, the State;

(ii) each Relevant Entity has the power and authority to do all acts and things and execute and deliver all other documents as are required to be done, observed or performed by it in connection with its engagement by Developer;

(iii) each Relevant Entity has:

(A) obtained or will obtain and will maintain all necessary or required registrations, permits, licenses and approvals required under applicable Law; and

(B) the expertise, qualifications, experience, competence, skills and know-how to perform, in accordance with this Agreement and the Principal Subcontract to which it is a party, the Work that it has agreed to perform pursuant to such Principal Subcontract;

(iv) none of the Relevant Entities is in breach of any Law that would have a material adverse effect on the Work;

(v) each Principal Subcontract, and any amendments or supplements thereto, is in compliance with, and, as applicable, incorporates the terms set out in, Part A of Schedule 16 to the Project Agreement; and

(vi) no default under any Principal Subcontract has occurred and is continuing, and no fact or event exists that with the passage of time or giving of notice would constitute such a default.

Part B: Representations and Warranties of the Colorado Bridge Enterprise

(a) **Power and Authority**. BE is a government-owned business within CDOT and an enterprise within the meaning of Article X, Section 20(2)(d) of the Colorado Constitution, and BE has the legal power, right and authority to execute, deliver and, subject to the terms and conditions of each such document as such apply to BE, perform the Project Agreement, the Enterprise Closing Agreements to which BE is a party, the IAA, the Supplemental Indenture and the Central 70 Note (collectively, the "BE Agreements").

(b) **Authorization and Due Execution**.

(i) Each person executing any BE Agreement on behalf of BE has been (or, at the time of execution, will have been) duly authorized to execute and deliver such BE Agreement on behalf of BE.

(ii) The execution, delivery and performance of each BE Agreement has otherwise been duly authorized by BE.

(iii) Each BE Agreement has been (or will be) duly and validly executed and delivered by BE.

(c) **Enforceability**. Each BE Agreement constitutes (or, at the time of execution and delivery, will constitute) a legal, valid and binding obligation of BE enforceable against it in accordance with its terms as such terms separately apply to BE, except to the extent limited by applicable bankruptcy, insolvency, reorganization, moratorium or other similar laws affecting the enforceability of the rights of creditors generally, by general principles of equity, by the exercise by the State and its governmental bodies of the police power inherent in the sovereignty of the State and by the exercise by the United States of the powers delegated to it by the Constitution of the United States.

(d) **No Conflicts**. The execution and delivery by BE of the BE Agreements has not resulted in, and the performance thereof by BE will not result in:

(i) a breach of, default under or a violation of any agreement, instrument, judgment or decree to which BE is a party or is bound; or

(ii) a violation of any Law applicable to BE that is in effect on the date of execution and delivery of each BE Agreement.

(e) **Consents and Approvals**. Except as otherwise disclosed in writing by the Enterprises to Developer in connection with the occurrence of Key Financial Event of a type referred to in paragraphs d., e. or f. of the definition thereof in Part A of Annex A (*Definitions and Interpretation*) of the Project Agreement, as of the date on which this representation and warranty is given or repeated, no consent of any party and no Governmental Approval which has not already been obtained is required, as of such date, to have been obtained in connection with the execution, delivery and performance of any BE Agreement by BE.

(f) **Enterprise Default**. No Enterprise Default has occurred and is continuing, and no fact or event exists that with the passage of time or giving of notice would constitute an Enterprise Default.

(g) **Applicable Laws**. BE is not in breach of any Law that would have a material adverse effect on the performance of any of its obligations under any BE Agreement.

(h) **Legal Proceedings**. Except as otherwise disclosed in writing by the Enterprises to Developer in connection with the occurrence of any Key Financial Event of a type referred to in paragraphs d., e. or f. of the definition thereof in Part A of Annex A (*Definitions and Interpretation*) of the Project Agreement, no action, suit, proceeding, investigation or litigation is pending or overtly threatened in writing:

(i) that challenges:

(A) BE's authority to execute, deliver or perform;

(B) the legality, validity or enforceability of, as against BE; or

(C) the authority of any representative of BE executing,

in each case, any of the BE Agreements; or

(ii) that could reasonably be expected to have a material and adverse effect on the ability of BE to perform its obligations under the Project Agreement.

(i) **Eligible Project Costs**.

(i) The total federal assistance received and/or allocated and/or to be received and/or allocated by or to the Enterprises for the construction costs of the Project (specifically excluding costs for O&M Work) does not exceed 80% of "eligible project costs", as those costs are defined by any federal loan or grant agreement to which BE is a party or of which BE has actual knowledge.

(ii) The Enterprises have submitted to Build America Bureau information regarding all "eligible project costs" incurred to date by the Enterprises.

Part C: Representations and Warranties of the High Performance Transportation Enterprise

(a) **Power and Authority**. HPTE is a government-owned business within CDOT and an enterprise within the meaning of Article X, Section 20(2)(d) of the Colorado Constitution, and HPTE has the legal power, right and authority to execute, deliver and, subject to the terms and conditions of each such document as such apply to HPTE, perform the Project Agreement, the Enterprise Closing Agreements to which HPTE is a party and the IAA (collectively the "HPTE Agreements").

(b) **Authorization and Due Execution**.

(i) Each person executing any HPTE Agreement on behalf of HPTE has been (or, at the time of execution, will have been) duly authorized to execute and deliver such HPTE Agreement on behalf of HPTE.

(ii) The execution, delivery and performance of each HPTE Agreement has otherwise been duly authorized by HPTE.

(iii) Each HPTE Agreement has been (or will be) duly and validly executed and delivered by HPTE.

(c) **Enforceability**. Each HPTE Agreement constitutes (or, at the time of execution and delivery, will constitute) a legal, valid and binding obligation of HPTE enforceable against it in accordance with its terms as such terms separately apply to HPTE, except to the extent limited by applicable bankruptcy, insolvency, reorganization, moratorium or other similar laws affecting the enforceability of the rights of creditors generally, by general principles of equity, by the exercise by the State and its governmental bodies of the police power inherent in the sovereignty of the State and by the exercise by the United States of the powers delegated to it by the Constitution of the United States.

(d) **No Conflicts**. The execution and delivery by the HPTE of the HPTE Agreements has not resulted in, and the performance thereof by HPTE will not result in:

(i) a breach of, default under or a violation of any agreement, instrument, judgment or decree to which HPTE is a party or is bound; or

(ii) a violation of any Law applicable to HPTE that is in effect on the date of execution and delivery of each HPTE Agreement.

(e) **Consents and Approvals**. Except as otherwise disclosed in writing by the Enterprises to Developer in connection with the occurrence of any Key Financial Event of a type referred to in paragraphs d., e. or f. of the definition thereof in Part A of Annex A (*Definitions and Interpretation*) of the Project Agreement, as of the date on which this representation and warranty is given or repeated, no consent of any party and no Governmental Approval which has not already been obtained is required, as of such date, to have been obtained in connection with the execution, delivery and performance of any HPTE Agreement by HPTE.

(f) **Enterprise Default**. No Enterprise Default has occurred and is continuing, and no fact or event exists that with the passage of time or giving of notice would constitute an Enterprise Default.

(g) **Applicable Laws**. HPTE is not in breach of any Law that would have a material adverse effect on the performance of any of its obligations under any HPTE Agreement.

(h) **Legal Proceedings**. Except as otherwise disclosed in writing by the Enterprises to Developer in connection with the occurrence of any Key Financial Event of a type referred to in paragraphs d., e. or f. of the definition thereof in Part A of Annex A (*Definitions and Interpretation*) of the Project Agreement, no action, suit, proceeding, investigation or litigation is pending or overtly threatened in writing:

(i) that challenges:

(A) HPTE's authority to execute, deliver or perform;

(B) the legality, validity or enforceability of, as against HPTE; or

(C) the authority of any representative of HPTE executing,

in each case, of any of the HPTE Agreements; or

(ii) that could reasonably be expected to have a material and adverse effect on the ability of HPTE to perform its obligations under the Project Agreement.

(i) **Eligible Project Costs**.

(i) The total federal assistance received and/or allocated and/or to be received and/or allocated by or to the Enterprises for the construction costs of the Project (specifically excluding costs for O&M Work) does not exceed 80% of "eligible project costs", as those costs are defined by any federal loan or grant agreement to which HPTE is a party or of which HPTE has actual knowledge.

(ii) The Enterprises have submitted to the Build America Bureau information regarding all "eligible project costs" incurred to date by the Enterprises.

Schedule 3
Commencement and Completion Mechanics

Part 1: Commencement of NTP1 Work

1. In this Agreement, "NTP1 Conditions" means the following conditions, each of which shall be construed as a separate and independent condition:

   (a) Developer shall have submitted each Deliverable which is identified as being required to be submitted prior to the issuance of NTP1 in either (x) the "Schedule" column in any of the Deliverables tables in Schedule 8 (*Project Administration*), Schedule 10 (*Design and Construction Requirements*), Schedule 11 (*Operations and Maintenance Requirements*), Schedule 14 (*Strategic Communications*), Schedule 15 (*Federal and State Requirements*) (other than the first two Deliverables listed in the Deliverables Table in Schedule 14 and the first Deliverable listed in the Deliverables Table in Schedule 15), Schedule 17 (*Environmental Requirements*) and Schedule 18 (*Right-of-Way*) (collectively, the "Deliverables Tables") or (y) any other part of this Agreement (excluding such Schedules), and:

      (i) if Acceptance, Approval or other consent, approval or like assent of any such Deliverable is required as indicated in the Deliverables Tables or otherwise by the express terms of this Agreement, Developer shall have received such Acceptance, Approval or other consent, approval or like assent as applicable, of each such Deliverable; and

      (ii) if any such Deliverable is required to be submitted for Information as indicated in the Deliverables Tables or otherwise by the express terms of this Agreement, the initial review period as determined pursuant to Section 6(a) of Schedule 9 (*Submittals*) shall have expired with respect to each such Deliverable;

   (b) Developer shall have mobilized its quality management staff as anticipated by the Approved Stage 1 Quality Management Plan;

   (c) no Developer Default shall have occurred and be continuing; and

   (d) Developer shall have satisfied any other requirements and conditions that are required by the terms of this Agreement to have been satisfied prior to the issuance of NTP1 or the commencement of any NTP1 Work.

2. Pursuant to Section 9.1.a of the Project Agreement, Developer shall not be entitled to commence any NTP1 Work (other than those preparatory activities referenced in paragraphs b. and c. of the definition of NTP1 Work in Part A of Annex A (*Definitions and Abbreviations*) of the Project Agreement) until the Enterprises have issued NTP1 in accordance with Section 4(a) of this Part 1.

3. Developer shall notify the Enterprises promptly after it considers that all NTP1 Conditions have been satisfied.

4. The Enterprises shall promptly after receipt of a notice from Developer pursuant to Section 3 of this Part 1, and in any event within five Working Days after such receipt, either:

   (a) if they consider that all NTP1 Conditions have been satisfied, issue a notice ("NTP1") to Developer authorizing commencement of the NTP1 Work; or

   (b) if they do not consider that all NTP1 Conditions have been satisfied, notify Developer to such effect, specifying which NTP1 Conditions have not been satisfied and why they consider that such NTP1 Conditions have not been satisfied.

5. If the Enterprises issue a notice to Developer pursuant to Section 4(b) of this Part 1, then the procedures set out in Sections 3 and 4 of this Part 1 shall be repeated until the Enterprises issue NTP1.

Part 2: Commencement of Construction Work and O&M During Construction Work

1. In this Agreement, "NTP2 Conditions" means the following conditions, each of which shall be construed as a separate and independent condition:

   (a) NTP1 shall have been issued;

   (b) the FHWA shall have approved the initial financial plan submitted by Developer pursuant to Section 8.3.3.a.i.B.I. of the Project Agreement;

   (c) all Governmental Approvals and Permits applicable to the commencement of Construction Work and O&M Work During Construction shall have been obtained, any conditions thereto that are required to be satisfied in advance of such commencement shall have been satisfied, and Developer shall have otherwise complied with its obligations in relation to such Governmental Approvals and Permits pursuant to this Agreement, including under Section 8.4.2 of the Project Agreement and under Section 5 of Schedule 8 (*Project Administration*);

   (d) Developer shall have delivered to the Enterprises:

      (i) copies of all Governmental Approvals and Permits referred to in Section 1(c) of this Part 2; and

      (ii) evidence that any conditions thereto that are required to be satisfied in advance of commencement of the Construction Work and O&M During Construction have been satisfied;

   (e) Developer shall have demonstrated the functionality and use of its Maintenance Management Information System to the satisfaction of the Enterprises (acting in their discretion) and such Maintenance Management Information System shall be fully operational and substantially populated, as determined by reference to Section 7 of Schedule 11 (*Operations and Maintenance Requirements*);

   (f) Developer shall have submitted to the Enterprises, and received Acceptance of, a written protocol pursuant to Section 19.1.3.d of the Project Agreement;

   (g) Developer shall have submitted each Deliverable which is identified as being required to be submitted either (1) prior to the issuance of NTP2 or (2) a specified number of days after the issuance of NTP1, either (x) in the "Schedule" column in any of the Deliverables Tables (other than the third Deliverable listed in the Deliverables Table in Schedule 14 (*Strategic Communications*)) or (y) any other part of this Agreement (excluding the Schedules referred to in Section 1(a) of Part 1 of this Schedule 3), and:

      (i) if Acceptance, Approval or other consent, approval or like assent of any such Deliverable is required as indicated in the Deliverables Tables or otherwise by the express terms of this Agreement, Developer shall have received such Acceptance, Approval or other consent, approval or like assent as applicable, of each such Deliverable; and

      (ii) if any such Deliverable is required to be submitted for Information as indicated in the Deliverables Tables or otherwise by the express terms of this Agreement, the initial review period as determined pursuant to Section 6(a) of Schedule 9 (*Submittals*) shall have expired with respect to each such Deliverable;

   (h) Developer shall have delivered to the Enterprises the Contractor Bonds as required pursuant to Section 9.3.1.a.i of the Project Agreement;

   (i) no Developer Default shall have occurred and be continuing; and

   (j) Developer shall have satisfied any other requirements and conditions that are required by the terms of this Agreement to have been satisfied prior to the issuance of NTP2 and the commencement of the Construction Work and O&M Work During Construction (other than Snow and Ice Control Services).

2. Pursuant to Section 9.1.b of the Project Agreement, Developer shall not be entitled to:

   (a) commence any Construction Work or O&M Work During Construction until the Enterprises have issued NTP2 in accordance with Sections 4(a) and 5 of this Part 2; or

   (b) commence any specific aspect of the Construction Work or O&M Work During Construction pursuant to this Agreement until any applicable condition to such commencement specified in this Agreement (including in Schedule 8 (*Project Administration*), Schedule 10 (*Design and Construction Requirements*) and Schedule 11 (*Operations and Maintenance Requirements*)) has been satisfied.

3. Developer shall notify the Enterprises promptly after it considers that all NTP2 Conditions have been satisfied.

4. The Enterprises shall promptly after receipt of a notice from Developer pursuant to Section 3 of this Part 2 and, in any event, within five Working Days after such receipt either:

   (a) if they consider that all NTP2 Conditions have been satisfied, issue a notice to Developer to such effect; or

   (b) if they do not consider that all NTP2 Conditions have been satisfied, notify Developer to such effect, specifying which NTP2 Conditions have not been satisfied and why they consider that such NTP2 Conditions have not been satisfied.

5. If:

   (a) the Financial Close Date has occurred prior to, or is the same date as, the date of issuance by the Enterprises of a notice pursuant to Section 4(a) of this Part 2, then such notice shall constitute "NTP2"; or

   (b) the Enterprises issue a notice pursuant to Section 4(a) of this Part 2 prior to the Financial Close Date, they shall issue a further notice on the Financial Close Date which shall constitute "NTP2".

6. If the Enterprises issue a notice to Developer pursuant to Section 4(b) of this Part 2, then the procedures set out in Sections 3 and 4 of this Part 2 shall be repeated until the Enterprises issue NTP2 in accordance with Sections 4(a) and 5 of this Part 2.

Part 3: Commencement of Snow and Ice Control Services

1. In this Agreement, "NTP3 Conditions" means the following conditions:

   (a) NTP1 and NTP2 shall have been issued; and

   (b) Financial Close shall have occurred.

2. Subject to the obligations of Developer to perform Snow and Ice Control Services pursuant to Section 2.2.2.b of Schedule 11 (*Operations and Maintenance Requirements*) (which obligations shall arise whether or not either (1) NTP3 has been issued or (2) the Snow and Ice Control Commencement Date has occurred), pursuant to Section 9.1.a.iii of the Project Agreement, Developer shall not be entitled to:

   (a) commence Snow and Ice Control Services pursuant to this Agreement until:

      (i) the Enterprises have issued NTP3 in accordance with this Part 3; and

      (ii) the Snow and Ice Control Commencement Date has occurred; and

   (b) commence any specific aspect of Snow and Ice Control Services pursuant to this Agreement until any applicable condition to such commencement specified in this Agreement (including in Schedule 8 (*Project Administration*), Schedule 10 (*Design and Construction Requirements*) and Schedule 11 (*Operations and Maintenance Requirements*)) has been satisfied.

3. After satisfaction of the NTP3 Conditions, the Enterprises shall at any time thereafter issue a notice ("NTP3") to Developer authorizing and requiring commencement of Snow and Ice Control Services pursuant to Section 2.2.1 of Schedule 11 (*Operations and Maintenance Requirements*) on the date specified in such notice (the "Snow and Ice Control Commencement Date"), which date shall be no earlier than the later of: (a) July 1, 2018; and (b) 30 Calendar Days after the date of such notice.

Part 4: Milestone Completion

1. In this Agreement, "Milestone Completion Conditions" means, in respect of any Payment Milestone, the following conditions, each of which shall be construed as a separate and independent condition:

   (a) the Enterprises shall have Approved a Milestone Completion Punch List in respect of the relevant Payment Milestone;

   (b) Developer shall:

      (i) have completed any Milestone Completion Punch List Items that are required in such Milestone Completion Punch List to be completed as Milestone Completion Conditions in respect of the relevant Payment Milestone; and

      (ii) otherwise be in compliance with Section 4 of Part 7 of this Schedule 3 with respect to such Milestone Completion Punch List;

   (c) subject only to any incomplete Milestone Completion Punch List Items in respect of the relevant Payment Milestone which are permitted to be completed after the relevant Milestone Completion Date, Developer shall have completed the Construction Work related to the relevant Payment Milestone in accordance with this Agreement including:

      (i) the repair, replacement or correction and full remediation of all Defects and the remediation of all Nonconforming Work pursuant to Section 6.5 of Schedule 8 (*Project Administration*); and

      (ii) any such Construction Work related to Local Agency Roadways,

      including such that:

      (iii) in the case of all Payment Milestones, the infrastructure constituting the relevant Payment Milestone is in a condition that can be operated for safe vehicular travel in all lanes and at all points of entry and exit; and

      (iv) in the case of Payment Milestone 3 and Payment Milestone 4, the traffic shall have been properly transferred on to the infrastructure constituting such Payment Milestone pursuant to Schedule 10 (*Design and Construction Requirements*);

   (d) Developer shall have provided the Enterprises with a written certificate, in form and substance reasonably acceptable to the Enterprises, that limited Closures on the infrastructure constituting such Payment Milestone are required or expected for the remainder of the Construction Period;

   (e) Developer shall have conducted, and provided the Enterprises with an opportunity to witness, all tests and inspections necessary to provide measurement records for each Element of the relevant Payment Milestone in accordance with the Performance and Measurement Table set out in Appendix A-1 to Schedule 11 (*Operations and Maintenance Requirements*) and Developer's Approved Quality Management Plan;

   (f) any systems and equipment in relation to the relevant Payment Milestone which Developer is required to install pursuant to this Agreement:

      (i) shall have been installed;

      (ii) shall comply, in all respects, with applicable Law; and

      (iii) excluding ETC or ITS Elements, shall:

         (A) be fully operational and functional; and

         (B) have passed any tests and inspections required under this Agreement,

in each case subject only to completion of any incomplete Milestone Completion Punch List Items in respect of the relevant Payment Milestone which are permitted to be completed after the relevant Milestone Completion Date;

(g) Developer shall have submitted certificates in respect of the relevant Payment Milestone in the form and content as required by Section 6.4.3.b.i of Schedule 8 (*Project Administration*);

(h) Developer shall have provided the Enterprises with lien waivers as required pursuant to Section 4(c) of Schedule 5 (*Milestone Payments*);

(i) no Developer Default shall have occurred and be continuing (except with respect to any Developer Default number (2), (3), (4) or (5) in Section 32.1.1 of the Project Agreement that shall be cured upon achievement of Milestone Completion of the relevant Payment Milestone (in the case of Developer Default number (5), simultaneously with achievement of Substantial Completion) and in respect of which the Enterprises have not issued a Termination Notice pursuant to Section 33.1.3.a of the Project Agreement); and

(j) Developer shall have satisfied any other requirements and conditions that are required by the terms of this Agreement to have been satisfied prior to completion of such Payment Milestone.

2. Developer shall provide the Enterprises with at least 40 Working Days' advance notice of the date of the expected Milestone Completion of any Payment Milestone, which notice shall expressly and conspicuously state that it is being delivered pursuant to this Section 2 of Part 4 of this Schedule 3.

3. During the 40 Working Day period following receipt by the Enterprises of a notice pursuant to Section 2 of this Part 4, Developer and the Enterprises shall meet, confer and exchange information on a regular and cooperative basis, and the Enterprises shall conduct:

(a) an inspection of the Construction Work comprising the relevant Payment Milestone and its components (which may be conducted jointly with FHWA and/or CDOT pursuant to Section 21.1.1.a of the Project Agreement); and

(b) such other investigation and review of reports, data and documentation, as in each case may be necessary (as determined by the Enterprises, acting reasonably) to evaluate whether all of the applicable Milestone Completion Conditions in respect of the relevant Payment Milestone have been satisfied.

4. After Developer has given a notice pursuant to Section 2 of this Part 4 in respect of a Payment Milestone, Developer shall provide the Enterprises a further notice when Developer considers that all applicable Milestone Completion Conditions have been satisfied, which notice shall include a written certification, in form and substance reasonably acceptable to the Enterprises, that all applicable Milestone Completion Conditions in respect of the relevant Payment Milestone have been satisfied.

5. Within five Working Days after receipt of a notice and certification pursuant to Section 4 of this Part 4, the Enterprises shall either:

(a) if they consider that all applicable Milestone Completion Conditions have been satisfied, issue a certificate to such effect (a "Milestone Completion Certificate"), and the date of such Milestone Completion Certificate shall be the "Milestone Completion Date"; or

(b) if they do not consider that all applicable Milestone Completion Conditions have been satisfied, notify Developer to such effect, specifying which Milestone Completion Conditions have not been satisfied and why they consider that such Milestone Completion Conditions have not been satisfied.

6. If the Enterprises issue a notice to Developer pursuant to Section 5(b) of this Part 4, then the procedures set out in Sections 2 to 5 of this Part 4 shall be repeated until the Enterprises issue a Milestone Completion Certificate in respect of the relevant Payment Milestone.

Part 5: Substantial Completion

1. In this Agreement, "Substantial Completion Conditions" means the following, each of which shall be construed as a separate and independent condition:

(a) the Milestone Completion Date shall have occurred in respect of each of the Payment Milestones and all Milestone Completion Conditions in respect of all Payment Milestones shall remain satisfied;

(b) the Enterprises shall have Approved Developer's completion of all work with respect to all Milestone Completion Punch List Items on the basis that the relevant Construction Work completed as a result of the completion of such Punch List Items is in full compliance with the applicable requirements of this Agreement;

(c) Developer shall have completed the Construction Work for the Project in accordance with this Agreement, including:

(i) the repair, replacement or correction and full remediation of all Defects; and

(ii) the remediation of all Nonconforming Work pursuant to Section 6.5 of Schedule 8 (*Project Administration*),

including such that the Project is in a condition that can be open to traffic in the final configuration (subject only to completion of (A) any incomplete Substantial Completion Punch List Items which are permitted to be completed after the Substantial Completion Date and (B) any Construction Work the completion of which constitutes a Final Acceptance Condition);

(d) Developer shall have provided the Enterprises with a written certificate, in form and substance reasonably acceptable to the Enterprises, that no Closures are required or expected during the Operating Period other than (i) Excused Closures and (ii) Permitted Operating Period Closures;

(e) Developer shall have complied with Sections 3.5.6, 3.5.7, 3.5.8 and 3.5.9 of Schedule 10 (*Design and Construction Requirements*), and each time period referenced therein shall have expired;

(f) Developer shall have conducted, and provided the Enterprises an opportunity to witness, all tests and inspections necessary to provide measurement records for each Element of the entire Project in accordance with the Performance and Measurement Tables and Developer's Approved Quality Management Plan;

(g) Developer shall have delivered to the Enterprises the Contractor Bonds as required pursuant to Section 9.3.1.a.ii of the Project Agreement;

(h) the Enterprises shall have Approved any updates:

(i) that Developer has submitted to the Enterprises pursuant to Section 4.2.6 of Schedule 11 (*Operations and Maintenance Requirements*); and

(ii) to the Performance and Measurement Table set out in Appendix A-2 to Schedule 11 (*Operations and Maintenance Requirements*);

(i) any systems and equipment which Developer is required to install pursuant to this Agreement:

(i) shall have been installed;

(ii) shall comply, in all respects, with applicable Law;

(iii) shall be fully operational and functional; and

(iv) shall have passed any tests and inspections required under this Agreement,

in each case subject only to completion of:

(v) any incomplete Substantial Completion Punch List Items which are permitted to be completed after the Substantial Completion Date; and

(vi) any Construction Work the completion of which constitutes a Final Acceptance Condition;

(j) Developer shall have delivered to the Enterprises all reports, data and documentation relating to such tests and inspections as are referred to in Section 1(f) of Part 4 and in Section 1(i) of this Part 5;

(k) the Enterprises shall have Approved a Substantial Completion Punch List;

(l) Developer shall:

(i) have completed any Substantial Completion Punch List Items that are required in such Substantial Completion Punch List to be completed as Substantial Completion Conditions; and

(ii) otherwise be in compliance with Section 4 of Part 7 of this Schedule 3 with respect to such Substantial Completion Punch List;

(m) if any Governmental Authority, Railroad or Utility Owner with jurisdiction over any portion of the Project requires any form of certification of design, engineering or construction with respect to such portion, including any certifications or approvals required under any Permit or Governmental Approval, Developer shall have caused such certificates or approvals to be executed and delivered and shall have concurrently provided copies of such certificates or approvals to the Enterprises;

(n) Developer shall have submitted each Deliverable which is identified as being required to be submitted prior to issuance of Substantial Completion either (x) in the "Schedule" column in any of the Deliverables Tables or (y) any other part of this Agreement (excluding the Schedules referred to in Section 1(a) of Part 1 of this Schedule 3) and:

(i) if Acceptance, Approval or other consent, approval or like assent of any such Deliverable is required as indicated in the Deliverables Tables or otherwise by the express terms of this Agreement, Developer shall have received such Acceptance, Approval or other consent, approval or like assent as applicable, of each such Deliverable; and

(ii) if any such Deliverable is required to be submitted for Information as indicated in the Deliverables Tables, the initial review period as determined pursuant to Section 6(a) of Schedule 9 (*Submittals*) shall have expired with respect to each such Deliverable;

(o) Developer shall have submitted certificates in respect of Substantial Completion in the form and content as required by Section 6.4.3.b.i of Schedule 8 (*Project Administration*);

(p) with respect to all Insurance Policies that are required by Section 25 and Schedule 13 (*Required Insurances*) to be in effect on and from the Substantial Completion Date:

(i) such policies shall have been obtained from Eligible Insurers on terms that comply with Section 25 and Schedule 13 (*Required Insurances*) and shall be in full force and effect; and

(ii) the Enterprises shall have received binding verifications of coverage from the relevant insurers (or Developer's insurance brokers) of such Insurance Policies, in compliance with Section 25.3.1 of the Project Agreement as Accepted by the Enterprises;

(q) Developer shall have provided the Enterprises with lien waivers as required pursuant to Section 4(c) of Schedule 5 (*Milestone Payments*);

(r) no Developer Default shall have occurred and be continuing (except with respect to any Developer Default number (2), (3), (4) or (5) in Section 32.1.1 of the Project Agreement that shall be cured upon achievement of Substantial Completion) and in respect of which the Enterprises have not issued a Termination Notice pursuant to Section 33.1.3.a of the Project Agreement); and

(s) Developer shall have satisfied any other requirements and conditions that are required by the terms of this Agreement to have been satisfied prior to Substantial Completion.

2. Developer shall provide the Enterprises with 40 Working Days' advance notice of the date of expected Substantial Completion, which notice shall expressly and conspicuously state that it is being delivered pursuant to this Section 2 of Part 5 of this Schedule 3.

3. During the 40 Working Day period following receipt by the Enterprises of a notice pursuant to Section 2 of this Part 5, Developer and the Enterprises shall meet, confer and exchange information on a regular and cooperative basis, and the Enterprises shall conduct;

(a) an inspection of the entire Project and its components (including all Milestone Completion Punch List Items) (which may be conducted jointly with FHWA and/or CDOT pursuant to Section 21.1.1.a of the Project Agreement); and

(b) such other investigation and review of reports, data and documentation, as in each case may be necessary (as determined by the Enterprises, acting reasonably) to evaluate whether all of the Substantial Completion Conditions have been satisfied.

4. After Developer has given a notice pursuant to Section 2 of this Part 5, Developer shall provide the Enterprises a further notice when Developer considers that all Substantial Completion Conditions have been satisfied, which notice shall include a written certification, in form and substance reasonably acceptable to the Enterprises, that all Substantial Completion Conditions have been satisfied.

5. Within five Working Days after receipt of a notice and certification pursuant to Section 4 of this Part 5, the Enterprises shall either:

(a) if they consider that all applicable Substantial Completion Conditions have been satisfied, issue a certificate to such effect (a "Substantial Completion Certificate"), and the date of such Substantial Completion Certificate shall be the "Substantial Completion Date"; or

(b) if they do not consider that all Substantial Completion Conditions have been satisfied, notify Developer to such effect, specifying which Substantial Completion Conditions have not been satisfied and why they consider that such Substantial Completion Conditions have not been satisfied.

6. If the Enterprises issue a notice to Developer pursuant to Section 5(b) of this Part 5, then the procedures set out in Sections 2 to 5 of this Part 5 shall be repeated until the Enterprises issue a Substantial Completion Certificate.

Part 6: Final Acceptance

1. In this Agreement, "Final Acceptance Conditions" means the following, each of which shall be construed as a separate and independent condition:

   (a) the Substantial Completion Date shall have occurred and all Substantial Completion Conditions shall remain satisfied;

   (b) the Enterprises shall have Approved Developer's completion of all work with respect to all Substantial Completion Punch List Items on the basis that the relevant Construction Work completed as a result of the completion of such Punch List Items is in full compliance with the applicable requirements of this Agreement;

   (c) all previously identified Defects shall have been repaired, replaced or otherwise corrected and fully remedied as required by this Agreement and all Nonconforming Work shall have been remedied pursuant to Section 6.5 of Schedule 8 (*Project Administration*);

   (d) Developer shall have provided the Enterprises with a written certificate, in form and substance reasonably acceptable to the Enterprises, that no Closures are required or expected during the Operating Period other than (i) Excused Closures and (ii) Permitted Operating Period Closures;

   (e) the Enterprises shall have received and Accepted a complete set of As-Built survey sheets for the Project in the form and content as required by Schedule 10 (*Design and Construction Requirements*);

   (f) the Enterprises shall have received and Accepted a complete set of the As-Built drawings in the form and content required by Schedule 8 (*Project Administration*) and Schedule 10 (*Design and Construction Requirements*);

   (g) the Final Acceptance Condition specified in Section 14.9 of Schedule 10 (*Design and Construction Requirements*) shall have been, and shall remain, satisfied;

   (h) Developer shall have submitted certificates in respect of Final Acceptance in the form and content as required by Section 6.4.3.b.i of Schedule 8 (*Project Administration*);

   (i) Developer shall have submitted each Deliverable which is identified as being required to be submitted prior to issuance of Final Acceptance in either (x) the "Schedule" column in any of the Deliverables Tables or (y) any other part of this Agreement (excluding the Schedules referred to in Section 1(a) of Part 1 of this Schedule 3) and:

      (i) if Acceptance, Approval or other consent, approval or like assent of any such Deliverable is required as indicated in the Deliverables Tables or otherwise by the express terms of this Agreement, Developer shall have received such Acceptance, Approval or other consent, approval or like assent as applicable, of each such Deliverable; and

      (ii) if any such Deliverable is required to be submitted for Information as indicated in the Deliverables Tables, the initial review period as determined pursuant to Section 6(a) of Schedule 9 (*Submittals*) shall have expired with respect to each such Deliverable;

   (j) no Developer Default shall have occurred and be continuing (except with respect to any Developer Default number (2), (3) or (4) in Section 32.1.1 of the Project Agreement that shall be cured upon achievement of Final Acceptance) and in respect of which the Enterprises have not issued a Termination Notice pursuant to Section 33.1.3.a of the Project Agreement); and

   (k) Developer shall have satisfied any other requirements and conditions that are required by the terms of this Agreement to have been satisfied prior to Final Acceptance.

2. Developer shall provide the Enterprises with 40 Working Days' advance notice of the date of expected Final Acceptance, which notice shall expressly and conspicuously state that it is being delivered pursuant to this Section 2 of Part 6 of this Schedule 3.

3. During the 40 Working Day period following receipt by the Enterprises of a notice pursuant to Section 2 of this Part 6, Developer and the Enterprises shall meet, confer and exchange information on a regular and cooperative basis, and the Enterprises shall conduct:

   (a) an inspection of the entire Project and its components (including all Substantial Completion Punch List Items) (which may be conducted jointly with FHWA and/or CDOT pursuant to Section 21.1.1.a of the Project Agreement); and

   (b) such other investigation and review of reports, data and documentation, as in each case may be necessary (as determined by the Enterprises, acting reasonably) to evaluate whether all of the Final Acceptance Conditions have been satisfied.

4. After Developer has given a notice pursuant to Section 2 of this Part 6, Developer shall provide the Enterprises a further notice when Developer considers that all Final Acceptance Conditions have been satisfied, which notice shall include a written certification, in form and substance reasonably acceptable to the Enterprises, that all Final Acceptance Conditions have been satisfied.

5. Within five Working Days after receipt of a notice and certification pursuant to Section 4 of this Part 6, the Enterprises shall either:

   (a) if they consider that all applicable Final Acceptance Conditions have been satisfied, issue a certificate to such effect (a "Final Acceptance Certificate"), and the date of such Final Acceptance Certificate shall be the "Final Acceptance Date"; or

   (b) if they do not consider that all Final Acceptance Conditions have been satisfied, notify Developer to such effect, specifying which Final Acceptance Conditions have not been satisfied and why they consider that such Final Acceptance Conditions have not been satisfied.

6. If the Enterprises issue a notice to Developer pursuant to Section 5(b) of this Part 6, then the procedures set out in Sections 2 to 5 of this Part 6 shall be repeated until the Enterprises issue a Final Acceptance Certificate.

Part 7: Punch List Mechanism

1. Developer shall comply with the procedures and schedules for preparing Punch Lists and for completing Punch List Items pursuant to the Developer's Approved Project Management Plan and the provisions of this Part 7.

2. Following any inspection conducted:

   (a) pursuant to Section 3(a) of Part 4 of this Schedule 3, Developer shall promptly prepare and deliver to the Enterprises a list (a "Milestone Completion Punch List") of Punch List Items applicable to the relevant Payment Milestone ("Milestone Completion Punch List Items"), including a proposed date of completion for each item (which shall in no event be later than the then anticipated Substantial Completion Date);

   (b) pursuant to Section 3(a) of Part 5 of this Schedule 3, Developer shall promptly prepare and deliver to the Enterprises a list (a "Substantial Completion Punch List") of Punch List Items applicable to the entire Project ("Substantial Completion Punch List Items"), including a date of proposed completion for each item (which shall in no event be later than the Final Acceptance Deadline).

3. The Enterprises shall notify Developer within 10 Working Days of receipt of any Punch List pursuant to Section 3 of this Part 7 whether they Approve the contents of such Punch List or dispute or reject the inclusion (or omission) of any Punch List Item on such Punch List.

4. Developer shall promptly commence (or, as applicable, continue) work on all Approved Punch List Items and diligently prosecute such work to completion by the date of completion specified in the Punch List and in any event no later than (i) Substantial Completion with respect to all Milestone Completion Punch Line Items and (ii) the Final Acceptance Deadline with respect to all Substantial Completion Punch List Items.

5. Developer shall, on an ongoing basis:

   (a) (i) verify that each item on any Punch List has been corrected or completed, (ii) provide all final documentation, and (iii) perform a final review and inspection to verify that Punch List Items have been resolved, in the case of each (i)-(iii) to the satisfaction of the Enterprises (acting in their discretion); and

   (b) provide the Enterprises with regular written updates regarding the same.

Schedule 4
Payments

Part 1: Construction Period

1. **Milestone Payments**

The Enterprises shall pay the Milestone Payments to Developer in accordance with Schedule 5 (*Milestone Payments*) in respect of Construction Work carried out during the Construction Period.

2. **Monthly Deductions Reports**

2.1 Developer shall submit to the Enterprises, no later than the tenth Working Day in each month that commences after the Financial Close Date (or, if earlier, the date of issuance of NTP1) and prior to the Substantial Completion Date, a report that complies with the requirements of Section 2.2 of this Part 1.

2.2 Each Monthly Deductions Report required to be submitted to the Enterprises pursuant to Section 2.1 of this Part 1 shall be in a form agreed by the Parties (acting reasonably) and shall contain the following information in relation to (unless expressly provided otherwise in this Section 2.2) the month that immediately precedes the month in which such Monthly Deductions Report is required to be submitted:

(a) details of:

(i) each Noncompliance Event (including the nature of such event, its Noncompliance Start Time and, if such time has occurred at the date of such report, its Noncompliance Rectification Time) that accrued Noncompliance Points in the CP Deduction Month in accordance with Table 6A.1 and Part 4 of Schedule 6 (*Performance Mechanism*); and

(ii) the number of Noncompliance Points that accrued in respect of each such Noncompliance Event in the CP Deduction Month (including details of how such number was calculated),

provided that, for certainty, in relation to any Noncompliance Event that occurred in (A) a month prior to the CP Deduction Month but which continued to subsist during the CP Deduction Month or (B) the CP Deduction Month but which continued to subsist after the end of the CP Deduction Month, the number of Noncompliance Points reported pursuant to this Section 2.2(a) shall be solely the number that accrued in the CP Deduction Month in accordance with Section 3 of Part 4 of Schedule 6 (*Performance Mechanism*);

(b) the aggregate number of Noncompliance Points that accrued in the CP Deduction Month in respect of all Noncompliance Events in accordance with Table 6A.1 and Part 4 of Schedule 6 (*Performance Mechanism*);

(c) the calculation of the Monthly Noncompliance Deduction for the CP Deduction Month;

(d) the cumulative total of Monthly Noncompliance Deductions for all months up to and including the CP Deduction Month;

(e) details of:

(i) each Non-Permitted Construction Closure (including the cause thereof, its start time and, if such time has occurred at the date of such report, its end time) that resulted in the accrual of one or more Construction Closure Deductions in the CP Deduction Month in accordance with Section 3 of Part 1 of Schedule 6 (*Performance Mechanism*); and

(ii) the amount of such Construction Closure Deductions that accrued in respect of each such Non-Permitted Construction Closure in the CP Deduction Month (including details of how such amount was calculated),

provided that, for certainty, in relation to any Non-Permitted Construction Closure that commenced in (A) a month prior to the CP Deduction Month but which continued to subsist during the CP Deduction Month or (B) the CP Deduction Month but which continued to subsist after the end of the CP Deduction Month, the amount of Construction Closure Deductions reported pursuant to this Section 2.2(e) shall be solely the amount that accrued in the CP Deduction Month in accordance with Section 3.2(b) of Part 1 of Schedule 6 (*Performance Mechanism*);

(f) the calculation of the Monthly Construction Closure Deduction for the CP Deduction Month;

(g) the cumulative total of Monthly Construction Closure Deductions for all months up to and including the CP Deduction Month;

(h) the aggregate of the amounts referred to in Sections 2.2(c) and (f) of this Part 1;

(i) the aggregate of the amounts referred to in Sections 2.2(d) and (g) of this Part 1;

(j) sufficient information to evidence whether:

(i) either of the Noncompliance Default Events specified in paragraph a.i or a.ii of the definition thereof in Part A of Annex A (*Definitions and Abbreviations*) to the Project Agreement; and/or

(ii) either of the Increased Oversight Thresholds specified in paragraph a.i or a.ii of the definition thereof in Part A of Annex A (*Definitions and Abbreviations*) to the Project Agreement,

has occurred, which information shall include the cumulative number of Noncompliance Points accrued during each of the 12 month period and the 36 month period ending at the end of the CP Deduction Month; and

(k) sufficient information to evidence whether either of the Closure Default Events specified in paragraph a.i or a.ii of the definition thereof in Part A of Annex A (*Definitions and Abbreviations*) to the Project Agreement has occurred, which information shall include the cumulative amount of Construction Closure Deductions accrued during the four month period and the 12 month period ending at the end of the CP Deduction Month.

Following submission of any Monthly Deductions Report pursuant to this Part 1 or Section 4(b)(ii) of Schedule 5 (*Payment Milestones*), Developer shall provide such other information as may reasonably be requested by the Enterprises in respect of the calculation of any amounts referenced in such report.

2.3 The Enterprises shall notify Developer in writing (with reasons and any supporting documentation available to the Enterprises) within ten Working Days of receipt of any such Monthly Deductions Report if there is any part of such report which the Enterprises dispute, provided that a failure by the Enterprises to notify Developer of a Dispute within such period shall not constitute a waiver of their rights to do so at a later date.

2.4 If the Parties agree or it is determined pursuant to the Dispute Resolution Procedures that any Monthly Deductions Report was incorrect or inaccurate, then Developer shall be required (if requested by the Enterprises) to submit a corrected report and shall, in any event, reflect such correction, as appropriate, in the next Monthly Deductions Report to be submitted to the Enterprises pursuant to Section 2.1 of this Part 1 after the Parties reach agreement or the Dispute is resolved, provided that, in the event that any such inaccuracy is identified or Dispute resolved after payment of the Substantial Completion Payment, Developer shall be required to reflect the necessary adjustment, as appropriate, in the next Payment Request submitted to the Enterprises after identification of such inaccuracy or resolution of such Dispute.

Part 2: Operating Period

1. **Performance Payments**

The Enterprises shall pay Performance Payments to Developer during the Operating Period, as calculated in accordance with Part 2 of Schedule 6 (*Performance Mechanism*).

2. **Payment Requests**

2.1 No later than the tenth Working Day in each Payment Month (other than the First Payment Month if the Substantial Completion Date occurs after the tenth Working Day of such month), Developer shall submit a payment request for the Performance Payment payable in respect of the Payment Month in which such payment request is submitted, together with a Monthly Deductions Report in accordance with Section 3 of this Part 2.

2.2 If the Substantial Completion Date occurs after the tenth Working Day of the First Payment Month, Developer shall submit a separate Payment Request for the Performance Payment payable in respect of the First Payment Month at the same time as, pursuant to Section 2.1 of this Part 2, it submits a Payment Request for the Performance Payment payable in respect of the second Payment Month.

2.3 Each Payment Request shall set out:

(a) the amount of the Performance Payment payable in respect of the relevant Payment Month;

(b) the calculation of the amount of the Operations Goal Deduction in respect of the relevant Payment Month as calculated in accordance with Section 1(d) of Part 2 of Schedule 6 (*Performance Mechanism*);

(c) the Agreed or Determined amount of any Monthly Noncompliance Deductions and/or Operating Period Closure Deductions that accrued in any month prior to the relevant Payment Month which have not been reflected in any prior Payment Request (including as a result of the accrual or amount thereof having been in dispute);

(d) any amount required to be reflected in such Payment Request pursuant to the proviso to Section 2.4 of Part 1 of this Schedule 4;

(e) if such Payment Request is in respect of the First Payment Month and the Substantial Completion Deduction Amount exceeded the Substantial Completion Milestone Payment, an amount equal to such excess, provided that each Payment Request submitted after such Payment Request shall include any portion of such amount that has not been taken into account in a prior Payment Request;

(f) any other amounts due under this Agreement from Developer to the Enterprises or from the Enterprises to Developer and not previously included in a Payment Request or Milestone Payment Request (including, if applicable, any amount payable by the Enterprises to the Developer pursuant to Section 1.3.1.c of Schedule 15 (*Federal and State Requirements*));

(g) any adjustments to reflect over-payments and/or under-payments (each such adjustment stated separately) of any amount due prior to the relevant Payment Month (for which adjustment has not already been made);

(h) any interest payable by the Enterprises or Developer in respect of any amount that previously became payable to, respectively, Developer or the Enterprises and not previously included in a Payment Request or Milestone Payment Request; and

(i) the net amount owing to Developer by the Enterprises or by Developer to the Enterprises in respect of the relevant Payment Month.

2.4 Each Payment Request shall be accompanied by:

(a) work papers clearly setting out the derivation of all amounts set out in the Payment Request to the extent not detailed in the Monthly Deductions Report submitted at the same time as such Payment Request; and

(b) lien waivers duly executed by:

(i) Developer;

(ii) all Subcontractors that performed Work during the relevant Payment Month; and

(iii) if the Enterprises in their discretion elected to pay the amount of the Payment Request submitted in respect of any previous Payment Month notwithstanding the failure by Developer to have delivered a lien waiver that complies with the requirements of this Section 2.4(b) from any Subcontractor, any such Subcontractor,

all of which waivers shall be in the form required by the applicable provisions of Section 6 of Part 3 of this Schedule 4.

2.5 The Enterprises shall notify Developer in writing (with reasons and any supporting documentation available to the Enterprises) within ten Working Days of receipt of any Monthly Deductions Report or Payment Request if there is any part of such report or Payment Request which the Enterprises dispute, provided that a failure by the Enterprises to notify Developer of a Dispute within such period shall not constitute a waiver of their rights to do so at a later date.

2.6 The Enterprises shall pay Developer within 45 Calendar Days of the receipt of a Payment Request which is accurate and complete in accordance with the terms of this Schedule 4.

2.7 If:

(a) the Parties agree or it is determined pursuant to the Dispute Resolution Procedures that any Monthly Deductions Report and/or Payment Request was incorrect or inaccurate, then Developer shall be required to submit a corrected report and/or Payment Request, as the case may be; or

(b) the inaccuracy was identified or the Dispute resolved after the payment of the amount set out in the Payment Request affected by such inaccuracy, the necessary adjustment(s) shall be reflected, as appropriate, in the next Monthly Deductions Report and/or Payment Request to be submitted to the Enterprises after the Parties reach agreement or the Dispute is resolved.

2.8 In no event shall the Enterprises be obligated to pay interest on any late payments arising due to any such inaccuracies.

2.9 The Enterprises may delay payment of the final Performance Payment to be made under this Agreement prior to the Expiry Date for an additional 30 Calendar Days in order to verify the Monthly Deductions Report and Payment Request applicable to such final payment and to allow time for the receipt and verification by the Procuring Authorities of the report submitted pursuant to Section 3.1 of this Part 2 in respect of the Final Payment Month. The Enterprises shall also be entitled to deduct from the Performance Payment otherwise payable in respect of the Final Payment Month the amount of the Monthly Noncompliance Deduction and Operating Period Closure Deductions that accrue in the Final Payment Month.

3. **Monthly Deductions Reports**

3.1 Each Payment Request shall be accompanied by a report that complies with the requirements of Section 3.2 of this Part 2. In addition, at a date in the Final Payment Month to be agreed between the Parties, Developer shall submit a report that complies with such requirements, which report shall provide the required information in respect of the Final Payment Month (such that, for the purposes of such report, references to the OP Deduction Month in Section 3.2 of this Part 2 shall be deemed to be references to the Final Payment Month).

3.2 Each Monthly Deductions Report required to be submitted to the Enterprises pursuant to Section 3.1 of this Part 2 shall be in a form agreed by the Parties (acting reasonably) and shall contain the following information in relation to (unless expressly provided otherwise in this Section 3.2) the month that immediately precedes the month in which such Monthly Deductions Report is required to be submitted (in the case of each such Monthly Deductions Report, such preceding month, the "OP Deduction Month"):

(a) details of:

(i) each Noncompliance Event (including the nature of such event, its Noncompliance Start Time and, if such time has occurred at the date of such report, its Noncompliance Rectification Time) that accrued Noncompliance Points in the OP Deduction Month in accordance with Table 6A.2 and Part 4 of Schedule 6 (*Performance Mechanism*); and

(ii) the number of such Noncompliance Points that accrued in respect of each such Noncompliance Event (including details of how such number was calculated),

provided that, for certainty, in relation to any such Noncompliance Event that occurred in (A) a month prior to the OP Deduction Month but which continued to subsist during the OP Deduction Month or (B) the OP Deduction Month but which continued to subsist after the end of the OP Deduction Month, the number of Noncompliance Points reported pursuant to this Section 3.2(a) shall be solely the number that accrued in the OP Deduction Month in accordance with Section 3 of Part 4 of Schedule 6 (*Performance Mechanism*);

(b) the aggregate number of Noncompliance Points that accrued in the OP Deduction Month in respect of all Noncompliance Events in accordance with Table 6A.2 and Part 4 of Schedule 6 (*Performance Mechanism*);

(c) the calculation of the Monthly Noncompliance Deduction for the OP Deduction Month;

(d) the cumulative total of Monthly Noncompliance Deductions for all months up to and including the OP Deduction Month;

(e) details of:

(i) each Non-Permitted Operating Period Closure (including the cause thereof, its start time and, if such time has occurred at the date of such report, its end time) that resulted in the accrual of one or more Operating Period Closure Deductions in the OP Deduction Month in accordance with Section 3 of Part 3 of Schedule 6 (*Performance Mechanism*) and Part 5 of Schedule 6 (*Performance Mechanism*); and

(ii) the amount of such Operating Period Closure Deductions that accrued in respect of each such Operating Period Closure Event in the OP Deduction Month (including details of how such amount was calculated),

provided that, for certainty, in relation to any Non-Permitted Operating Period Closure that commenced (A) in a month prior to the OP Deduction Month but which continued to subsist during the OP Deduction Month or (B) in the OP Deduction Month but which continued to subsist after the end of the OP Deduction Month, the amount of Operating Period Closure Deductions reported pursuant to this Section 3.2(e) shall be solely the amount that accrued in the OP Deduction Month in accordance with Section 1.2 of Part 5 of Schedule 6 (*Performance Mechanism*);

(f) the calculation of the Monthly Operating Period Closure Deduction for the OP Deduction Month;

(g) the cumulative total of Monthly Operating Period Closure Deductions for all months up to and including the OP Deduction Month;

(h) the calculation of the Monthly Performance Deduction for the OP Deduction Month, being the aggregate of the amounts referred to in Sections 3.2(c) and (f) of this Part 2;

(i) the cumulative total of Monthly Performance Deductions for all months up to and including the OP Deduction Month, being the aggregate of the amounts referred to in Sections 3.2(d) and (g) of this Part 2;

(j) sufficient information to evidence whether:

(i) either of the Noncompliance Default Events specified in paragraph b.i or b.ii of the definition thereof in Part A of Annex A (*Definitions and Abbreviations*) to the Project Agreement; and/or

(ii) either of the Increased Oversight Thresholds specified in paragraph b.i or b.ii of the definition thereof in Part A of Annex A (*Definitions and Abbreviations*) to the Project Agreement,

has occurred, which information shall include the cumulative number of Noncompliance Points accrued during each of the 12 month period and the 36 month period ending at the end of the OP Deduction Month; and

(k) sufficient information to evidence whether any of the Closure Default Events specified in paragraph b.i, b.ii or b.iii of the definition thereof in Part A of Annex A (*Definitions and Abbreviations*) to the Project Agreement has occurred, which information shall include the cumulative amount of Operating Period Closure Deductions accrued during the one month period, the four month period and the 12 month period ending at the end of the OP Deduction Month.

Following submission of any Monthly Deductions Report pursuant to this Part 2, Developer shall provide such other information as may reasonably be requested by the Enterprises in respect of the calculation of any amounts referenced in such report.

Part 3: General

1. **Payments by the Department**

Developer agrees that, to the extent that CDOT makes payment to Developer of any amount payable under this Agreement, such payment shall, to the extent of the amount paid by CDOT, be deemed to have discharged the obligation of the Enterprises to make the relevant payment under this Agreement.

2. **Due Date**

Unless expressly provided otherwise, the due date for all payments under this Agreement shall be the date which is 45 Calendar Days (in the case of payments to be made by the Enterprises) and 30 Calendar Days (in the case of payments to be made by Developer) after receipt of written request therefor by the Party from which payment is claimed (together with such supporting documentation as is required under this Agreement or reasonably requested by such Party).

3. **Default Interest**

In the event that any of the Parties fails to pay any amount under this Agreement on the due date therefor, or any of the Parties makes an over-payment of any amount, the Parties have agreed that interest:

(a) calculated at the Default Interest Rate and on the basis of a 360 day year for the actual days elapsed, shall be added to any late payment from and excluding the due date to and including the date of payment; or

(b) in the amount earned in respect of any over-payment by the recipient of such over-payment, shall be credited to the Party that made the over-payment from and excluding the date of over-payment to and including the date on which the Party that made the over-payment receives credit therefor.

4. **Disputed Amounts**

4.1 Notwithstanding any other provision of this Agreement, the Enterprises shall have the right to dispute any amount specified in a Milestone Payment Request, Payment Request or Monthly Deductions Report, in which event the Enterprises shall pay the amount of the Milestone Payment Request or Payment Request in question that is not in dispute and will be entitled to withhold the balance pending resolution of the Dispute.

4.2 Developer shall have the right to dispute any determination by the Enterprises that a Milestone Payment Request, Payment Request or Monthly Deductions Report is incomplete and/or incorrect in a material respect.

4.3 Any amount determined to be due pursuant to the Dispute Resolution Procedures shall be paid within 45 Calendar Days (in the case of payments to be made by the Enterprises) and 30 Calendar Days (in the case of payments to be made by Developer) following resolution of the Dispute, together with interest thereon in accordance with Section 3 of this Part 3, provided that in no event shall the Enterprises be obligated to pay interest on any late payments arising due to any inaccuracy in a Milestone Payment Request, Payment Request or Monthly Deductions Report.

5. **Set-off**

Notwithstanding any other provision of this Agreement:

(a) the Enterprises may set-off against any amount owing to Developer under this Agreement any amount which is Agreed or Determined to be due from Developer under this Agreement, including:

(i) any funds that must be withheld pursuant to the requirements of C.R.S. § 38-26-107(2) and the amount of all loss, damage, cost or expense (including reasonable attorneys' fees (including the fees of the State's Attorney General's Office)), arising out of any claim, lien or action by Developer or any

Subcontractor against the Enterprises, CDOT or the Project with respect to the claims, rights and liens waived and released pursuant to any lien waiver executed pursuant to the Sections of this Schedule 4 and Schedule 5 (*Milestone Payments*) referred to in Section 6 of this Part 3;

(ii) any amount that the Enterprises are entitled to deduct from the Performance Payments pursuant to Section 4.2(c) of Schedule 12 (*Handback Requirements*); and

(iii) any amounts permitted to be withheld in accordance with Section 53.7 of the Project Agreement.

(b) Developer may set-off against any amount owing to the Enterprises under this Agreement any amount which is Agreed or Determined to be due from the Enterprises under this Agreement.

6. **Lien Waivers**

(a) Any lien waiver required to be executed by Developer pursuant to Section 2.4(b)(i) of Part 2 of this Schedule 4 or Section 4(c)(i) of Schedule 5 (*Milestone Payments*) shall be:

(i) with respect to any payment prior to the final payment referred to in Section 6(a)(ii) of this Part 3, substantially in the form set out in Appendix A to this Schedule 4; and

(ii) with respect to the final Performance Payment to be paid under this Agreement, substantially in the form set out in Appendix B to this Schedule 4.

(b) Any lien waiver required to be executed by a Subcontractor pursuant to Section 2.4(b)(ii) or 2.4(b)(iii) of Part 2 of this Schedule 4 or Section 4(c)(ii) or 4(c)(iii) of Schedule 5 (*Milestone Payments*) shall be:

(i) if, at the time of execution of such lien waiver, the Subcontractor has not yet become entitled to receive the final payment under its Subcontract, substantially in the form set out in Appendix C to this Schedule 4; and

(ii) if, at the time of execution of such lien waiver, the Subcontractor is entitled to receive the final payment under its Subcontract, substantially in the form set out in Appendix D to this Schedule 4.

Appendix A
Form of Developer Partial Lien Waiver

DEVELOPER PARTIAL WAIVER OF LIENS

This partial lien waiver is issued pursuant to the requirements of the Project Agreement for the Central 70 Project dated as of November 21, 2017 (the "Project Agreement"), by and among: Colorado High Performance Transportation Enterprise ("HPTE"), a government-owned business within, and a division of, the Colorado Department of Transportation ("CDOT"); Colorado Bridge Enterprise, a government-owned business within CDOT (together with HPTE and CDOT, the "Owners") and Kiewit Meridiam Partners LLC, a limited liability company formed under the laws of the State of Delaware (the "Developer") for the design, construction, financing, operation and maintenance of a portion of the I-70 East corridor in Greater Denver (the "Project").

DEVELOPER: Kiewit Meridiam Partners LLC
160 Inverness Drive West, Suite 110
Englewood, Colorado 80112

OWNERS: Colorado High Performance Transportation Enterprise
Address:
c/o Colorado Department of Transportation
4201 East Arkansas Avenue
Denver, Colorado 80222

and

Colorado Bridge Enterprise
Address:
c/o Colorado Department of Transportation
4201 East Arkansas Avenue
Denver, Colorado 80222

and

Colorado Department of Transportation
Address:
4201 East Arkansas Avenue
Denver, Colorado 80222

PAYMENT AMOUNT: $[*amount*] [*Developer to specify amount of the relevant Milestone Payment Request or Payment Request*]

DATE: [*month*][*day*], [*year*] ("Waiver Date")

PAYMENT DESCRIPTION AND NUMBER: [*details to be included by Developer*]

1. The undersigned is a contractor who has furnished labor, laborers, material, rental machinery, tools and/or equipment, among other services and things, in connection with the Project in its capacity as Developer pursuant to the Project Agreement (the "Work Performed").

2. The undersigned has been paid in full for all amounts that have become due and owing under the Project Agreement to date for Work Performed through the Waiver Date ("Relevant Amounts"),

subject to collection of payment of the "Payment Amount" as referred to above and any other payment the due date for which has not yet occurred.

3. The undersigned waives and releases all claims and rights of any kind against the Owners or the Project which the undersigned can or may have, in respect of the Relevant Amounts, to file any liens against the Owners or the Project for Work Performed through the Waiver Date (including, without limitation, any mechanic's or materialmen's liens, and any liens pursuant to C.R.S. §§ 38-26-101 through and including § 38-26-110).

4. The undersigned represents and warrants that all persons or entities, if any, who have, directly or indirectly, furnished labor, laborers, material, rental machinery, tools and/or equipment to the undersigned in connection with the Work Performed have been paid in full for all amounts they are owed, subject to any payment that is dependent on collection by Developer of the payments referred to in paragraph 2 above.

[***remainder of page left intentionally blank; signature page follows***]

DEVELOPER:

KIEWIT MERIDIAM PARTNERS LLC

By: _____

Name: _____

Title: _____

STATE OF COLORADO)
) ss.
COUNTY OF _____)

Subscribed and sworn to before me this _____ day of _____, 20___, by _____ as _____ of _____

_____
Notary Public

My Commission Expires: _____

Appendix B
Form of Developer Final Lien Waiver

DEVELOPER FINAL WAIVER OF LIENS

This lien waiver issued pursuant to the requirements of the Project Agreement for the Central 70 Project dated as of November 21, 2017 (the "Project Agreement"), by and among: Colorado High Performance Transportation Enterprise ("HPTE"), a government-owned business within, and a division of, the Colorado Department of Transportation ("CDOT"); Colorado Bridge Enterprise, a government-owned business within CDOT (together with HPTE and CDOT, the "Owners") and Kiewit Meridiam Partners LLC, a limited liability company formed under the laws of the State of Delaware (the "Developer") for the design, construction, financing, operation and maintenance of a portion of the I-70 East corridor in Greater Denver (the "Project").

DEVELOPER:	Kiewit Meridiam Partners LLC 160 Inverness Drive West, Suite 110 Englewood, Colorado 80112
OWNERS:	Colorado High Performance Transportation Enterprise Address: c/o Colorado Department of Transportation 4201 East Arkansas Avenue Denver, Colorado 80222 and Colorado Bridge Enterprise Address: c/o Colorado Department of Transportation 4201 East Arkansas Avenue Denver, Colorado 80222 and Colorado Department of Transportation Address: 4201 East Arkansas Avenue Denver, Colorado 80222
PAYMENT AMOUNT:	$[*amount*] [*Developer to specify amount of the relevant Payment Request*]
DATE:	[*month*][*day*], [*year*] ("Waiver Date")
PAYMENT DESCRIPTION AND NUMBER:	[*details to be included by Developer*]

1. The undersigned is a contractor who has furnished labor, laborers, material, rental machinery, tools and/or equipment, among other services and things, in connection with the Project in its capacity as Developer pursuant to the Project Agreement (the "Work Performed").
2. The undersigned has been paid in full for all amounts that have become due and owing under the Project Agreement to date for Work Performed through the Waiver Date ("Relevant Amounts"), subject to collection of payment of the "Payment Amount" as referred to above, and no work remains to be performed under the Project Agreement that could result in the requirement for further payments to be made to the undersigned.

3. The undersigned waives and releases all claims and rights of any kind against the Owners or the Project which the undersigned can or may have, in respect of the Relevant Amounts, to file any liens against the Owners or the Project for Work Performed through the Waiver Date (including, without limitation, any mechanic's or materialmen's liens, and any liens pursuant to C.R.S. §§ 38-26-101 through and including § 38-26-110).

4. The undersigned represents and warrants that all persons or entities who have, directly or indirectly, furnished labor or materials to the undersigned in connection with the Work Performed have been paid in full for all amounts they are owed, subject to any payment that is dependent on collection by Developer of the payments referred to in paragraph 2.

[***remainder of page left intentionally blank; signature page follows***]

DEVELOPER:

KIEWIT MERIDIAM PARTNERS LLC

By: _____

Name: _____

Title: _____

STATE OF COLORADO)
) ss.
COUNTY OF _____)

Subscribed and sworn to before me this _____ day of _____, 20___, by _____ as _____ of _____

_____
Notary Public

My Commission Expires: _____

Appendix C
Form of Subcontractor Partial Lien Waiver

SUBCONTRACTOR PARTIAL WAIVER OF LIENS

This partial lien waiver is issued pursuant to the requirements of the Project Agreement for the Central 70 Project dated as of November 21, 2017 (the "Project Agreement"), by and among: Colorado High Performance Transportation Enterprise ("HPTE"), a government-owned business within, and a division of, the Colorado Department of Transportation ("CDOT"); Colorado Bridge Enterprise, a government-owned business within CDOT (together with HPTE and CDOT, the "Owners") and Kiewit Meridiam Partners LLC, a limited liability company formed under the laws of the State of Delaware (the "Developer") for the design, construction, financing, operation and maintenance of a portion of the I-70 East corridor in Greater Denver (the "Project").

SUBCONTRACTOR: [*name*]
[*address*]

OWNERS: Colorado High Performance Transportation Enterprise
Address:
c/o Colorado Department of Transportation
4201 East Arkansas Avenue
Denver, Colorado 80222

and

Colorado Bridge Enterprise
Address:
c/o Colorado Department of Transportation
4201 East Arkansas Avenue
Denver, Colorado 80222

and

Colorado Department of Transportation
Address:
4201 East Arkansas Avenue
Denver, Colorado 80222

DATE: [*month*][*day*], [*year*] ("Waiver Date")

APPLICABLE SUBCONTRACT: The undersigned has entered into [*agreement name*] with [*name*], dated as of [*date*], for [*description of the work performed*] in regards to the Project for the maximum amount of [*amount*][1] (the "Agreement").[2]

1. The undersigned is a subcontractor who has furnished labor, laborers, material, rental machinery, tools and/or equipment in connection with the Project as described in the Agreement (the "Work Performed").
2. The undersigned has been paid in full for all amounts that have become due and owing under the Agreement to date for Work Performed through the Waiver Date ("Relevant Amounts").
3. The undersigned waives and releases all claims and rights of any kind against the Owners or the Project which the undersigned can or may have, in respect of the Relevant Amounts, to file any

[1] Modify to reflect actual payment terms, as needed
[2] If the undersigned is not a Principal Subcontractor, add a sentence linking the "Agreement" to the Developer through the various tiers of Subcontractors.

liens against the Owners or the Project for Work Performed through the Waiver Date (including, without limitation, any mechanic's or materialmen's liens, and any liens pursuant to C.R.S. §§ 38-26-101 through and including § 38-26-110).

4. The undersigned represents and warrants that all persons or entities, if any, who have, directly or indirectly, furnished labor, laborers, material, rental machinery, tools and/or equipment to the undersigned in connection with the Work Performed have been paid in full for all amounts they are owed, subject to any payment that is dependent on collection by Developer of the payments referred to in paragraph 2 above.

[***remainder of page left intentionally blank; signature page follows***]

SUBCONTRACTOR:

[*company name*]

By: _____

Name: _____

Title: _____

STATE OF COLORADO)
) ss.
COUNTY OF _____)

Subscribed and sworn to before me this _____ day of _____, 20___, by _____ as _____ of _____

_____
Notary Public

My Commission Expires: _____

Appendix D
Form of Subcontractor Final Waiver of Lien

SUBCONTRACTOR FINAL WAIVER OF LIENS

This lien waiver is issued pursuant to the requirements of the Project Agreement for the Central 70 Project dated as of November 21, 2017 (the "Project Agreement"), by and among: Colorado High Performance Transportation Enterprise ("HPTE"), a government-owned business within, and a division of, the Colorado Department of Transportation ("CDOT"); Colorado Bridge Enterprise, a government-owned business within CDOT (together with HPTE and CDOT, the "Owners") and Kiewit Meridiam Partners LLC, a limited liability company formed under the laws of the State of Delaware (the "Developer") for the design, construction, financing, operation and maintenance of a portion of the I-70 East corridor in Greater Denver (the "Project").

SUBCONTRACTOR:	[*name*] [*address*]
OWNERS:	Colorado High Performance Transportation Enterprise Address: c/o Colorado Department of Transportation 4201 East Arkansas Avenue Denver, Colorado 80222 and Colorado Bridge Enterprise Address: c/o Colorado Department of Transportation 4201 East Arkansas Avenue Denver, Colorado 80222 and Colorado Department of Transportation Address: 4201 East Arkansas Avenue Denver, Colorado 80222
DATE:	[*month*][*day*], [*year*] ("Waiver Date")
APPLICABLE SUBCONTRACT:	The undersigned has entered into [*agreement name*] with [*name*], dated as of [*date*], for [*description of the work performed*] in regards to the Project for the maximum amount of [*amount*][3] (the "Agreement").[4]

1. The undersigned is a subcontractor who has furnished labor, laborers, material, rental machinery, tools and/or equipment in connection with the Project as described in the Agreement (the "Work Performed").
2. The undersigned has been paid in full for all amounts that have become due and owing under the Agreement to date for Work Performed through the Waiver Date ("Relevant Amounts"), subject to collection of any payment that is dependent on payment of the amount referenced in Developer's payment request to which this lien waiver is attached, and no work remains to be performed

[3] Modify to reflect actual payment terms, as needed.
[4] If the undersigned is not a Principal Subcontractor, add a sentence linking the "Agreement" to the Developer through the various tiers of Subcontractors.

under the Agreement that could result in the requirement for further payments to be made to the undersigned.

3. The undersigned waives and releases all claims and rights of any kind against the Owners or the Project which the undersigned can or may have, in respect of the Relevant Amounts, to file any liens against the Owners or the Project including, without limitation, any mechanic's or materialmen's liens, and any liens pursuant to C.R.S. §§ 38-26-101 through and including § 38-26-110.

4. The undersigned represents and warrants that all persons or entities who have furnished labor or materials to the undersigned in connection with the Work Performed have been paid in full for all amounts they are owed, subject to any payment that is dependent on collection by Developer of the payments referred to in paragraph 2 above.

[*remainder of page left intentionally blank; signature page follows*]

SUBCONTRACTOR:

[*company name*]

By: _____

Name: _____

Title: _____

STATE OF COLORADO)
) ss.
COUNTY OF _____)

Subscribed and sworn to before me this _____ day of _____, 20___, by _____ as _____ of _____

_____
Notary Public

My Commission Expires: _____

Schedule 5
Milestone Payments

1. The table in this Section 1 sets out the amount (each a "Milestone Payment") payable by the Enterprises in respect of the achievement of each Payment Milestone and Substantial Completion, subject to the provisions of this Schedule 5. For certainty, the descriptions of the Payment Milestones in the table below are for reference only; the full definitions of each Payment Milestone are set out in Part A of Annex A (*Definitions and Abbreviations*) to the Project Agreement and the conditions to achievement of each Payment Milestone and Substantial Completion are set out in, respectively, Parts 4 and 5 of Schedule 3 *(Commencement and Completion Mechanics*).

Milestone Payment Table

Event	**Milestone Payment**
Completion of Milestone 1 (Sand Creek Bridge to Chambers Road)	
Completion of Milestone 2 (Dahlia Street to Sand Creek Bridge)	
Completion of Milestone 3 (WB I-70 Brighton Boulevard to Dahlia Street)	
Completion of Milestone 4 (EB I-70 Brighton Boulevard to Dahlia Street)	
Substantial Completion	
TOTAL	

2. Each Milestone Payment shall be payable no later than the date which is 45 Calendar Days after receipt by the Enterprises of a payment request (a "Milestone Payment Request") from Developer for such Milestone Payment that complies with the requirements of Section 4 of this Schedule 5 (such date, the "Milestone Payment Request Due Date" in respect of such Milestone Payment Request), provided that:

(a) Developer shall only be entitled to deliver a Milestone Payment Request for a Milestone Payment if, on the Milestone Payment Request Due Date in respect of such Milestone Payment Request (the "Relevant Milestone Payment Request Due Date"), the aggregate amount of:

(i) such Milestone Payment Request;

(ii) any Milestone Payment Request(s) delivered simultaneously with such Milestone Payment Request; and

(iii) all previous Milestone Payment Requests delivered pursuant to this Section 2,

will be less than or equal to the amount specified in the "Cumulative Available Funds" column in the table in this Section 2(a) in respect of the period during which the Relevant Milestone Payment Request Due Date occurs;

Cumulative Available Funds Table

Period	**Cumulative Available Funds**
July 1, 2017 – June 30, 2018	
July 1, 2018 – June 30, 2019	
July 1, 2019 – June 30, 2020	
July 1, 2020 and after	

(b) without prejudice to the requirements of Section 4 of this Schedule 5 (including the requirement that any Milestone Payment Request must be accompanied by the relevant Milestone Completion Certificate or the Substantial Completion Certificate, as the case may be), in order to comply with Section 2(a) of this Schedule 5, Developer shall be entitled to deliver multiple Milestone Payment Requests for payment of less than the full amount of any single Milestone Payment; and

(c) each Milestone Payment Request shall be in respect of a single Milestone Payment (or a portion thereof).

3. Subject to set-off in accordance with Section 5 of Part 3 of Schedule 4 (*Payments*):

(a) each Milestone Payment (other than the Substantial Completion Milestone Payment), or portion thereof, shall be paid without deduction; and

(b) the Substantial Completion Milestone Payment shall have deducted from it the Substantial Completion Deduction Amount (the net amount following such deduction, the "Substantial Completion Payment").

4. A Milestone Payment Request delivered:

(a) for a Milestone Payment in respect of the completion of a Payment Milestone shall be accompanied by a copy of the Milestone Completion Certificate in respect of the relevant Payment Milestone;

(b) for the Substantial Completion Payment shall be accompanied by:

(i) a copy of the Substantial Completion Certificate; and

(ii) a report in the form of a Monthly Deductions Report required to be submitted to the Enterprises pursuant to Section 2.1 of Part 1 of Schedule 4 (*Payments*), which shall contain:

(A) the information specified in Section 2.2 of Part 1 of Schedule 4 (*Payments*) in relation to the period commencing on the day after the end of the CP Deduction Month that was the subject of the most recent Monthly Deductions Report submitted by Developer pursuant to Section 2.1 of Part 1 of Schedule 4 (*Payments*) up to and including the Substantial Completion Date (where, for the purposes of the report submitted pursuant to this Section 4(b)(ii), (A) references to the CP Deduction Month in Section 2.2 of Part 2 of Schedule 4 (*Payments*) shall be deemed to be references to the period referred to in this Section 4(b)(ii) and (B) Sections 2.3 and 2.4 of Part 1 of Schedule 4 (*Payments*) shall apply equally to the report submitted pursuant to this Section 4(b)(ii)); and

(B) details of the calculation of the Construction Goal Deduction in accordance with Section 1(c) of Part 1 of Schedule 6 (*Performance Mechanism*); and

(c) for any Milestone Payment shall be accompanied by lien waivers duly executed by:

(i) Developer;

(ii) all Subcontractors that performed Work since the date of the previous Milestone Payment Request or, in the case of the first Milestone Payment Request, since the Agreement Date (for certainty, including any Subcontractor that performed any Work since the applicable date and not only Subcontractors that performed Work in relation to the Payment Milestone that is the subject-matter of the relevant Milestone Payment Request); and

(iii) if the Enterprises in their discretion elected to pay the amount of any previous Milestone Payment Request notwithstanding the failure by Developer to have delivered a lien waiver that complies with the requirements of this Section 4(c) from any Subcontractor, any such Subcontractor,

all of which waivers shall be in the form required by the applicable provisions of Section 6 of Part 3 of Schedule 4 (*Payments*).

5. No later than ten Calendar Days before the Substantial Completion Date, the Enterprises shall publish notice of the anticipated Substantial Completion Date consistent with the requirements of C.R.S. § 38-26-107 such that any applicable Subcontractor who has not yet been paid may file with the Enterprises a verified statement of the amount due and unpaid on account of such Subcontractor's claim.

Schedule 6

Performance Mechanism

Part 1: Construction Period

1. Substantial Completion Deduction Amount

The Substantial Completion Deduction Amount ("SCDA") shall be calculated in accordance with the following formula:

$SCDA = MND_{sc} + MCCD_{sc} + CGD$

Where:

(a) MND_{sc} = an amount equal to the aggregate of all Monthly Noncompliance Deductions calculated in accordance with Section 2 of this Part 1 that accrued during:

(i) each month (m) that commences during the period from and excluding the Financial Close Date (or, if earlier, the date of issuance of NTP1) to and including the Substantial Completion Date; and

(ii) the month (m) in which the Financial Close Date occurs (or, if earlier, in which the date of issuance of NTP1 occurs),

(each month (m) falling within (i) or (ii), a "CP Deduction Month");

(b) $MCCD_{sc}$ = an amount equal to the aggregate of all Monthly Construction Closure Deductions calculated in accordance with Section 3 of this Part 1 that accrued during each CP Deduction Month; and

(c) CGD = an amount equal to the sum of:

(i) any "Construction Work Small Business Goal Deduction" calculated in accordance with Section 1.3.1.a. of Schedule 15 (*Federal and State Requirements*); *plus*

(ii) any "Construction Period OJT Goal Deduction" calculated in accordance with Section 1.3.1.b. of Schedule 15 (*Federal and State Requirements*).

2. Monthly Noncompliance Deduction prior to Substantial Completion

The Monthly Noncompliance Deduction ("MND") for any CP Deduction Month (m) shall be calculated in accordance with the following formula:

$MND_m = NCPV \times NCP_m$

Where:

(a) NCPV = being the unit value of each Noncompliance Point; and

(b) NCPm = the number of Noncompliance Points that accrued during CP Deduction Month (m) in accordance with Table 6A.1 and Part 4 of this Schedule 6.

3. Monthly Construction Closure Deduction

3.1 The Monthly Construction Closure Deduction ("MCCD") for any CP Deduction Month (m) shall be calculated in accordance with the following formula:

$$MCCD_m = \sum_{p=1}^{n} CCD_p$$

Where:

(a) p = a Closure Deduction Period that commenced during CP Deduction Month (m);

(b) n = the total number of Closure Deduction Periods that commenced during CP Deduction Month (m); and

(c) CCD_p = the Construction Closure Deduction in respect of each Closure Deduction Period (p).

3.2 For purposes of calculating the Monthly Construction Closure Deduction for any CP Deduction Month (m) pursuant to Section 3.1 of this Part 1:

(a) each Non-Permitted Construction Closure shall be deemed to:

(i) start when the relevant Closure actually starts (or is deemed to start in accordance with the proviso to the definition of Non-Permitted Construction Closure in Part A of Annex A (*Definitions and Abbreviations*) to the Project Agreement); and

(ii) end when the relevant Closure actually ends (or is deemed to end in accordance with such proviso);

(b) a Construction Closure Deduction shall accrue in the CP Deduction Month in which each individual full or partial Closure Deduction Period commences;

(c) a Closure that affects more than one travel lane shall, to the extent that such Closure otherwise constitutes a Non-Permitted Construction Closure within the definition thereof in Part A of Annex A (*Definitions and Abbreviations*) to the Project Agreement, be treated as a separate Non-Permitted Construction Closure of each affected travel lane;

(d) the proviso to Section 2.11.14.c of Schedule 10 (*Design and Construction Requirements*) shall apply in determining the number of separate Non-Permitted Construction Closures deemed to occur pursuant to such Section;

(e) depending upon the duration of any Non-Permitted Construction Closure, such Non-Permitted Construction Closure may result in one or more Construction Closure Deductions, which shall accrue in respect of each full or partial Closure Deduction Period that commences during the subsistence of such Non-Permitted Construction Closure; and

(f) each Non-Permitted Construction Closure shall result in the accrual of Construction Closure Deductions in addition to any Construction Closure Deductions that accrue in respect of any other Non-Permitted Construction Closure (including where both such Closures are simultaneously caused by the same circumstances).

Part 2: Performance Payments

1. **Monthly Performance Payments**

The Performance Payment ("PP") payable in respect of any Payment Month (m) shall be calculated in accordance with the following formula:

$PP_m = MaxPP_m – MPD_{m-1} – OGD_m$

Where:

(a) PP_m = 0, if $MPD_{m-1} \geq MaxPP_m$;

(b) $MaxPP_m$= the Maximum Performance Payment in respect of Payment Month (m), which shall be calculated in accordance with the following formula:

$$\mathrm{MaxPP_m} = \left(\frac{\mathrm{d_m}}{\mathrm{d_y}}\right) \times \mathrm{MaxPP_y}$$

Where:

(i) d_m = the number of Calendar Days in Payment Month (m) from and including the first day of Payment Month (m) (or, in the case of the First Payment Month, from and excluding the Substantial Completion Date) to and including the final day of Payment Month (m) (or to and excluding the Termination Date, if earlier);

(ii) d_y = the number of Calendar Days in Contract Year (y); and

(iii) $MaxPP_y$= the amount of the Maximum Performance Payment calculated in accordance with Section 2 of this Part 2 in respect of Contract Year (y);

(c) MPD_{m-1} = the Monthly Performance Deduction for month (m-1) (for clarity, month (m-1) in respect of Payment Month (m) is defined as the OP Deduction Month in respect of Payment Month (m)) calculated in accordance with Section 1 of Part 3 of this Schedule 6, provided that:

(i) for certainty, MPD_{m-1} = 0 where Payment Month (m) is the First Payment Month; and

(ii) where Payment Month (m) is the Final Payment Month, MPD_{m-1} shall equal the aggregate of the Monthly Performance Deduction for each of (A) the month immediately preceding the Final Payment Month and (B) the Final Payment Month (provided that, for purposes of calculating the Monthly Performance Deduction for the Final Payment Month, references in Part 3 of this Schedule 6 to OP Deduction Month (m) shall be deemed to be references to the Final Payment Month); and

(d) OGD_m = the "Operations Goal Deduction" in respect of Payment Month (m) which shall be calculated as follows:

$OGD_m = ROMESBGD_m + RWDBEGD_m + RWOJTGD_m$

Where:

(i) $ROMESBGD_m$ =

(A) in respect of each Payment Month (m) in which the first Payment Request is submitted after the amount of the five year Routine O&M Work ESB Goal deduction has been Agreed or Determined in respect of the previous five Contract Year period in accordance with Section 1.3.2.a of Schedule 15 (*Federal and State Requirements*), such amount; and

(B) subject to the proviso to this Section 1(d), in respect of each other Payment Month (m), nil;

(ii) $RWDBEGD_m$ =

(A) in respect of each Payment Month (m) in which the first Payment Request is submitted after the amount of the five year Renewal Work DBE Goal deduction has been Agreed or Determined in respect of the previous five Contract Year period in accordance with Section 1.3.2.b of Schedule 15 (*Federal and State Requirements*), such amount; and

(B) subject to the proviso to this Section 1(d), in respect of each other Payment Month (m), nil; and

(iii) $RWOJTGD_m$ =

(A) in respect of each Payment Month (m) in which the first Payment Request is submitted after the amount of the annual Renewal Work OJT Goal deduction has been Agreed or Determined in respect of the previous Contract Year in accordance with Section 1.3.2.c of Schedule 15 (*Federal and State Requirements*), such amount; and

(B) subject to the proviso to this Section 1(d), in respect of each other Payment Month (m), nil.

provided that, if OGD_m in any Payment Month (m) exceeds the amount of the Performance Payment otherwise payable in respect of such Payment Month (for certainty, determined as $MaxPP_m – MPD_{m-1}$, taking into account Section 1(a) of this Part 2), such excess shall be included by Developer in the next Payment Request submitted by it until the full amount of the deductions Agreed or Determined in accordance with Sections 1.3.2.a, b and c of Schedule 15 (*Federal and State Requirements*) have been deducted from Performance Payments.

2. **Maximum Performance Payment in each Payment Year**

The Maximum Performance Payment ("MaxPP") in respect of any Contract Year (y) shall be calculated in accordance with the following formula:

$$\mathrm{MaxPP}_y = (\mathrm{Base}_{\mathrm{CPP}} \times (1.02)^{\mathrm{n}}) + (\mathrm{Base}_{\mathrm{OMRP}} \times \left(\frac{\mathrm{CPI}_{\mathrm{y}}}{\mathrm{CPI}_{2017}}\right))$$

Where:

(a) $\mathrm{Base}_{\mathrm{CPP}}$ = the Base Capital Performance Payment in July 1, 2017 Dollars set out in the table in Section 2(f) of this Part 2;

(b) $\mathrm{Base}_{\mathrm{OMRP}}$= the Base OMR Payment in July 1, 2017 Dollars set out in the table in Section 2(f) of this Part 2;

(c) CPI_y = CPI as of July 1 of Contract Year (y);

(d) CPI_{2017} = CPI as of July 1, 2017;

(e) n = the number of Contract Years from and including the Contract Year commencing on July 1, 2017 to and excluding Contract Year (y); and

(f)

Base Capital Performance Payment (in nominal dollars as of July 1, 2017)	, as such amount may be amended pursuant to the Project Agreement Amendment in accordance with paragraph a. of the definition thereof in Part A of Annex A (*Definitions and Abbreviations*) of the Project Agreement.
Base OMR Payment (in nominal dollars as of July 1, 2017)	

Part 3: Performance Payment Deductions

1. **Payment Deductions after Substantial Completion**

The Monthly Performance Deduction ("MPD") for any OP Deduction Month (m) shall be calculated in accordance with the following formula:

$$\mathrm{MPD_m} = \mathrm{MND_m} + \mathrm{MOPCD_m}$$

Where:

(a) $\mathrm{MND_m}$ = the Monthly Noncompliance Deduction for OP Deduction Month (m) calculated in accordance with Section 2 of this Part 3; and

(b) $\mathrm{MOPCD_m}$= the Monthly Operating Period Closure Deduction for OP Deduction Month (m) calculated in accordance with Section 3 of this Part 3,

provided that the Monthly Performance Deduction for OP Deduction Month (m) shall not exceed the Maximum Performance Payment in respect of Payment Month (m) calculated in accordance with Section 1(b) of Part 2 of this Schedule 6.

2. **Monthly Noncompliance Deduction after Substantial Completion**

The Monthly Noncompliance Deduction ("MND") for any OP Deduction Month (m) shall be calculated in accordance with the following formula:

$$\mathrm{MND_m} = \mathrm{NCPV} \times \mathrm{NCP_m}$$

Where:

(a) NCPV = (indexed), being the unit value for each Noncompliance Point; and

(b) $\mathrm{NCP_m}$ = the number of Noncompliance Points that accrued during OP Deduction Month (m) in accordance with Table 6A.2 (or, in accordance with Section 5 of Part 4 of this Schedule 6, Table 6A.1) and Part 4 of this Schedule 6.

3. **Monthly Operating Period Closure Deduction**

3.1 The Monthly Operating Period Closure Deduction ("MOPCD") for any OP Deduction Month (m) shall be calculated in accordance with the following formula:

$$\mathrm{MOPCD_m} = \sum_{p=1}^{n} \mathrm{OPCD_p}$$

Where:

(a) p = a full or partial Closure Deduction Period that commenced during OP Deduction Month (m);

(b) n = the total number of full or partial Closure Deduction Periods that commenced during OP Deduction Month (m); and

(c) $\mathrm{OPCD_p}$ = the Operating Period Closure Deduction in respect of each full or partial Closure Deduction Period (p).

3.2 **The Operating Period Closure Deductions Table is set out below.**

Type of Closure	**Number of Lanes subject to the Closure**	**Operating Period Closure Deduction (each such amount to be indexed) in respect of each full or partial Closure Deduction Period that commences other than on a Weekend or a Holiday**
Closure of a General Purpose Lane in one direction in any O&M Segment	One Lane Closed	
	Two Lanes Closed	
	Three Lanes Closed	
Closure of a Tolled Express Lane in one direction in any O&M Segment	One Lane Closed	
Closure of an I-70 Mainline ramp in any O&M Segment	One Lane Closed	
	Two Lanes Closed	
Closure of a travel lane on a CDOT Roadway or a Local Agency Roadway or a cross street in one direction, or Closure of a CDOT Roadway or Local Agency Roadway ramp, in any O&M Segment	One Lane Closed	
	Two Lanes Closed	
	Three Lanes Closed	

3.3 At their sole discretion, the Enterprises shall be entitled, no more frequently than once every Contract Year during the Operating Period, to amend (by giving at least 30 Calendar Days' advance notice to Developer of the effective date of such amendment) the Operating Period Closure Deductions Table by either:

(a) amending the amount of any Operating Period Closure Deduction set out in the Operating Period Closure Deductions Table; and/or

(b) introducing different amounts of Operating Period Closure Deduction in respect of an individual type of Closure specified in the O&M Deductions Table for different O&M Segments,

provided that, following any such amendment:

(i) no Operating Period Closure Deduction shall exceed the highest Operating Period Closure Deduction set out in the Operating Period Closure Deductions Table prior to such amendment; and

(ii) the aggregate amount of all Operating Period Closure Deductions set out in the final column of the Operating Period Closure Deductions Table shall not exceed the aggregate thereof prior to such amendment.

3.4 Without prejudice to the right of the Enterprises in their sole discretion to make any amendments to the Operating Period Closure Deductions Table in accordance with Section 3.3 of this Part 3, they shall consult with Developer prior to giving a notice to Developer pursuant to such Section.

Part 4: Noncompliance Points

Each Noncompliance Event shall accrue Noncompliance Points as follows.

1. Subject to Section 4 of this Part 4, for any Noncompliance Event that has a Cure Period, such Noncompliance Event shall accrue the number of Noncompliance Points set out against such Noncompliance Event in Table 6A.1 or Table 6A.2, as applicable, for each full or partial Noncompliance Cure Period that commences at any time from and including:

   (a) if such Noncompliance Event does not have a Grace Period, the Noncompliance Start Time; and

   (b) if such Noncompliance Event has a Grace Period, the expiry of the Grace Period,

   in each case, until the Noncompliance Rectification Time.

2. For any Noncompliance Event that has no Cure Period, such Noncompliance Event shall accrue the number of Noncompliance Points set out against such Noncompliance Event in Table 6A.1 or Table 6A.2, as applicable, but shall not accrue any further Noncompliance Points during the period that the failure giving rise to the original Noncompliance Event continues to subsist. Notwithstanding the foregoing, any subsequent recurrence of the same Noncompliance Event shall be treated as a separate Noncompliance Event and shall accrue Noncompliance Points in accordance with this Part 4.

3. Noncompliance Points in respect of a Noncompliance Event:

   (a) that has a Cure Period shall accrue in the month in which each individual Noncompliance Cure Period commences; and

   (b) that has no Cure Period shall accrue in the month in which the Noncompliance Start Time occurs.

4. Subject to Section 1.2(b)(i) of Part 6 of this Schedule 6, if a Noncompliance Event has a Grace Period and the Noncompliance Rectification Time for such Noncompliance Event occurs prior to the expiry of such Grace Period, such Noncompliance Event shall not accrue any Noncompliance Points.

5. If the Noncompliance Start Time of any Noncompliance Event which has a Cure Period occurs prior to or on the Substantial Completion Date and such Noncompliance Event continues to subsist after the Substantial Completion Date, then:

   (a) if such Noncompliance Event is set out only in Table 6A.1, such Noncompliance Event shall accrue the number of Noncompliance Points set out against such Noncompliance Event in Table 6A.1 for each full or partial Noncompliance Cure Period (to be determined by reference to the Cure Period of such Noncompliance Event set out in Table 6A.1) that commences prior to, on or after the Substantial Completion Date; and

   (b) if such Noncompliance Event is set out in both Table 6A.1 and Table 6A.2, such Noncompliance Event shall accrue the number of Noncompliance Points set out against such Noncompliance Event:

      (i) in Table 6A.1 for each full or partial Noncompliance Cure Period (to be determined by reference to the Cure Period of such Noncompliance Event set out in Table 6A.1) that commences prior to or on the Substantial Completion Date (for certainty, including where such Noncompliance Cure Period ends after the Substantial Completion Date); and

      (ii) in Table 6A.2 for each full or partial Noncompliance Cure Period (to be determined by reference to the Cure Period of such Noncompliance Event set out in Table 6A.2) that commences after the Substantial Completion Date.

6. Nothing in this Agreement shall prevent the accrual of Noncompliance Points in respect of both the occurrence of a Noncompliance Event and the Noncompliance Event caused by the failure to notify the Enterprises of the same Noncompliance Event in accordance with this Agreement.

Part 5: Operating Period Closures

1. Occurrence of Operating Period Closures

1.1 Each Non-Permitted Operating Period Closure shall be deemed to:

(a) start when the relevant Closure actually starts (or is deemed to start in accordance with the proviso to the definition of Non-Permitted Operating Period Closure in Part A of Annex A (*Definitions and Abbreviations*) to the Project Agreement); and

(b) end when the relevant Closure actually ends (or is deemed to end in accordance with such proviso).

1.2 An Operating Period Closure Deduction shall accrue in the month in which each individual full or partial Closure Deduction Period commences.

1.3 A continuous Closure that affects more than one O&M Segment shall, to the extent that such Closure otherwise constitutes a Non-Permitted Operating Period Closure within the definition thereof in Part A of Annex A (*Definitions and Abbreviations*) to the Project Agreement, be treated as a separate Non-Permitted Operating Period Closure in each affected O&M Segment.

1.4 The proviso to Section 2.11.14.c of Schedule 10 (*Design and Construction Requirements*) shall apply in determining the number of separate Non-Permitted Operating Period Closures deemed to occur pursuant to Section 2.11.14.d of Schedule 10 (*Design and Construction Requirements*).

1.5 Depending upon the duration of any Non-Permitted Operating Period Closure, such Non-Permitted Operating Period Closure may result in one or more Operating Period Closure Deductions, which shall accrue in respect of each full or partial Closure Deduction Period that commences during the subsistence of such Non-Permitted Operating Period Closure.

1.6 Subject to Section 2.5 of this Part 5, each Non-Permitted Operating Period Closure (the "First Closure") shall result in the accrual of Operating Period Closure Deductions in addition to any Operating Period Closure Deductions that accrue in respect of any other Non-Permitted Operating Period Closure (the "Other Closure") (including where the Other Closure is simultaneously caused by the same circumstances as caused the First Closure), but, for certainty, without double-counting where the amount of the Operating Period Closure Deductions in respect of the Other Closure is determined by reference to the Operating Period Closure Deduction specified in any of the "Two Lanes Closed" or "Three Lanes Closed" rows in the Operating Period Closure Deductions Table and one of the two or three lanes is a lane that is the subject of the First Closure.

2. Operating Period Closure Deduction Modifications

2.1 Where a Non-Permitted Operating Period Closure is caused by the Closure of one or more contra-flow lanes, the Operating Period Closure Deduction in respect of each full or partial Closure Deduction Period that commences during the subsistence of such Non-Permitted Operating Period Closure shall be the Operating Period Closure Deduction that would otherwise have accrued multiplied by 110%.

2.2 Where a Non-Permitted Operating Period Closure is caused by the Closure of part of a ramp such that the ramp remains available for use by traffic but is partially restricted, the Operating Period Closure Deduction in respect of each full or partial Closure Deduction Period that commences during the subsistence of such Non-Permitted Operating Period Closure shall be the Operating Period Closure Deduction that would otherwise have accrued multiplied by 50%.

2.3 Where a Non-Permitted Operating Period Closure is caused by the Closure of a shoulder only, and continued flow of traffic on the adjacent travel lane may be safely permitted, the Operating Period Closure Deduction in respect of each full or partial Closure Deduction Period that commences during the subsistence of such Non-Permitted Operating Period Closure shall be the Operating Period Closure Deduction that would have accrued had the adjacent travel lane been subject to such Closure multiplied by 50%.

2.4 Where a Non-Permitted Operating Period Closure is caused by the Closure of a travel lane but the adjacent shoulder is temporarily utilized as a replacement travel lane, the Operating Period Closure Deduction in respect of each full or partial Closure Deduction Period that commences during the subsistence of such Non-Permitted Operating Period Closure shall be the Operating Period Closure Deduction that would otherwise have accrued multiplied by 50%.

2.5 Where a Non-Permitted Operating Period Closure is caused by the Closure of a single General Purpose Lane or Tolled Express Lane in one direction of travel and the adjacent shoulder is consequently closed or inaccessible to traffic, the Closure of the shoulder shall be deemed not to constitute a Non-Permitted Operating Period Closure.

2.6 Where a Non-Permitted Operating Period Closure is caused by the Closure of any sidewalk, the Operating Period Closure Deduction in respect of each full or partial Closure Deduction Period that commences during the subsistence of such Non-Permitted Operating Period Closure shall be the Operating Period Closure Deduction that would have accrued had one lane of the adjacent travel lane been subject to such Closure multiplied by 10%, provided that, for certainty:

(a) the Closure of each sidewalk on either side of the relevant travel lane shall constitute a separate Non-Permitted Operating Period Closure; and

(b) each Operating Period Closure Deduction that accrues in respect of the Non-Permitted Operating Period Closure of a sidewalk shall be in addition to any Operating Period Closure Deductions that accrue in respect of a Non-Permitted Operating Period Closure caused by the Closure of the adjacent travel lane.

2.7 Where a Non-Permitted Operating Period Closure is caused by the Closure of any driveway, the Operating Period Closure Deduction in respect of each full or partial Closure Deduction Period that commences during the subsistence of such Non-Permitted Operating Period Closure shall be the Operating Period Closure Deduction that would have accrued had one lane of the travel lane to which the driveway connects been subject to such Closure multiplied by 50%, provided that, for certainty, each Operating Period Closure Deduction that accrues in respect of the Non-Permitted Operating Period Closure of a driveway shall be in addition to any Operating Period Closure Deductions that accrue in respect of a Non-Permitted Operating Period Closure caused by the Closure of the travel lane to which such driveway connects.

Part 6: Reporting Requirements

1. **Notification**

1.1 Notification Initiated by Developer

(a) Developer shall notify the Enterprises in writing of the occurrence of any Noncompliance Event or the commencement of any Non-Permitted Closure or Excused Closure as soon as reasonably practicable, and in any event within twenty-four (24) hours, after Developer first becomes aware that the Noncompliance Event has occurred or the Non-Permitted Closure or Excused Closure has commenced. Such notice shall:

(i) in the case of a Noncompliance Event:

(A) provide reasonable detail of the circumstances of such Noncompliance Event and its Noncompliance Start Time;

(B) identify the number of Noncompliance Points and the Grace Period (if any) and the Cure Period (if any) for such Noncompliance Event, all as specified in Table 6A.1 or Table 6A.2, as applicable; and

(C) if such Noncompliance Event has been cured by the time notice is given pursuant to this Section 1.1(a), identify its Noncompliance Rectification Time (if such Noncompliance Event has a Cure Period) or the date and time that such Noncompliance Event was fully cured (if such Noncompliance Event does not have a Cure Period); or

(ii) in the case of a Non-Permitted Closure or Excused Closure:

(A) provide reasonable details of the circumstances of such Non-Permitted Closure or Excused Closure, its commencement time and (if it has ended by the time notice is given pursuant to this Section 1.1(a)), its end time;

(B) in the case of an Excused Closure:

(I) explain the basis (using the categories specified in paragraphs a. to f. of the definition of Excused Closure in Part A of Annex A (*Definitions and Abbreviations*) to the Project Agreement) on which Developer considers that the relevant Closure is an Excused Closure; and

(II) confirm that the relevant Closure did not arise as a result of any of the circumstances specified in paragraph g of the definition of Excused Closure in Part A of Annex A (*Definitions and Abbreviations*) to the Project Agreement; and

(C) explain the steps being taken by Developer to:

(I) mitigate the impact thereof;

(II) reopen the affected part(s) of the Project as quickly as possible to traffic; and

(III) if such Closure arose as the direct result of an Emergency, respond to the Emergency in accordance with the requirements of this Agreement.

Within ten Calendar Days after receiving a notice pursuant to this Section 1.1(a), the Enterprises shall deliver to Developer a written notice either confirming their agreement to, or disputing (with reasons), the information contained in Developer's notice. Due to extenuating circumstances, the Enterprises may, at their discretion, provide an extension to any Grace Period applicable to a Noncompliance Event so notified and will document such extension in the notice delivered by them pursuant to this Section 1.1(a).

(b) Developer shall notify the Enterprises in writing as soon as reasonably practicable, and in any event within 24 hours, after the occurrence of the Noncompliance Rectification Time in respect of any Noncompliance Event which has a Cure Period, the date and time that any Noncompliance Event which does not have a Cure Period has been fully cured or the end time of any Non-Permitted Closure or Excused Closure, including in such notice:

(i) in the case of a Noncompliance Event:

(A) the Noncompliance Rectification Time of such Noncompliance Event or, as the case may be, the date and time that such Noncompliance Event was fully cured;

(B) a detailed description of the manner in which such Noncompliance Event was cured; and

(C) a calculation of the total Noncompliance Points that accrued in respect of such Noncompliance Event; or

(ii) in the case of a Non-Permitted Closure or Excused Closure:

(A) the end time of such Non-Permitted Closure or Excused Closure; and

(B) in the case of a Non-Permitted Closure, a calculation of the total Construction Closure Deductions or Operating Period Closure Deductions, as the case may be, that accrued in respect of such Non-Permitted Closure.

(c) Within ten Calendar Days after receiving a notice pursuant to Section 1.1(b) of this Part 6, the Enterprises shall deliver to the Developer a written notice either confirming their agreement to, or disputing (with reasons), the information contained in Developer's notice.

(d) Developer shall be entitled to satisfy its notification obligations under this Section 1.1 by ensuring that the Noncompliance and Closure Database issues email or other alerts to the Enterprises, provided that such alerts:

(i) are received by the Enterprises within the time periods required by Section 1.1(a) or (b) of this Part 6, as applicable; and

(ii) either:

(A) contain the information required by Section 1.1(a) or (b) of this Part 6, as applicable; or

(B) provide a direct link to such information.

1.2 Notification Initiated by the Enterprises

(a) If the Enterprises believe that any Noncompliance Event has occurred or Non-Permitted Closure has commenced in respect of which the Enterprises have not received notification from Developer in accordance with Section 1.1(a) of this Part 6, the Enterprises may deliver to Developer a notice containing such of the information that is required to be included in the notice that Developer should have delivered pursuant to Section 1.1(a) of this Part 6 in respect of such Noncompliance Event or Non-Permitted Closure that is available to the Enterprises.

(b) In the event that the Enterprises deliver a notice pursuant to Section 1.2(a) of this Part 6:

(i) if a Noncompliance Event that has a Grace Period is the subject of such notice, such Noncompliance Event shall be deemed not to have a Grace Period even if a Grace Period is specified for such Noncompliance Event in Table 6A.1 or Table 6A.2, as applicable; and

(ii) the failure by Developer to issue a notice in respect of the relevant Noncompliance Event or Non-Permitted Closure shall itself constitute a Noncompliance Event in accordance with item 1.14 in Table 6A.1 or item 2.16 in Table 6A.2, as applicable.

2. **Noncompliance and Closure Database**

2.1 Without prejudice to Developer's obligations under Section 1 of this Part 6, Developer shall establish and maintain an electronic database that records on a real-time basis, and retains, information in relation to each and every Noncompliance Event, Non-Permitted Closure and Excused Closure that occurs or commences, as the case may be. The following data shall be recorded in such database:

(a) in respect of each Noncompliance Event (whether notified by Developer to the Enterprises pursuant to Section 1.1(a) of this Part 6 or by the Enterprises to Developer pursuant to Section 1.2(a) of this Part 6):

(i) a description of such Noncompliance Event in reasonable detail, including the circumstances giving rise to such Noncompliance Event, its Noncompliance Start Time, any applicable Cure Period or Grace Period and the number of Noncompliance Points set out for such Noncompliance Event in Table 6A.1 or Table 6A.2, as applicable;

(ii) the location of such Noncompliance Event within the Project (if applicable);

(iii) for any Noncompliance Event that is not yet cured:

(A) the calculation of the Noncompliance Points that have accrued in respect of such Noncompliance Event up to that time; and

(B) the steps being taken to cure it; and

(iv) for any Noncompliance Event that Developer considers to be cured:

(A) the Noncompliance Rectification Time of such Noncompliance Event (if such Noncompliance Event has a Cure Period) or the date and time that such Noncompliance Event was fully cured (if such Noncompliance Event does not have a Cure Period) and, in either case, the calculation of the total Noncompliance Points that accrued in respect of such Noncompliance Event; and

(B) the nature of the cure in reasonable detail and the measures that have been, and will be, taken to prevent the reoccurrence of such Noncompliance Event; and

(b) in respect of each Non-Permitted Closure (whether notified by Developer to the Enterprises pursuant to Section 1.1.(a) of this Part 6 or by the Enterprises to Developer pursuant to Section 1.2.(a) of this Part 6) and each Excused Closure:

(i) a description of such Non-Permitted Closure or Excused Closure in reasonable detail, including the location thereof within the Project, the circumstances giving rise to such Non-Permitted Closure or Excused Closure and its commencement time;

(ii) for any Non-Permitted Closure or Excused Closure that is continuing:

(A) in the case of a Non-Permitted Closure, the calculation of the Construction Closure Deductions or Operating Period Closure Deductions, as the case may be, that have accrued in respect of such Non-Permitted Closure up to that time; and

(B) a description of the steps being taken by Developer to:

(I) mitigate the impact thereof;

(II) reopen the affected part(s) of the Project as quickly as possible to traffic; and

(III) if such Closure arose as the direct result of an Emergency, respond to the Emergency in accordance with the requirements of this Agreement; and

(iii) for any Non-Permitted Closure or Excused Closure that has ended:

(A) the end time of such Non-Permitted Closure or Excused Closure;

(B) in the case of a Non-Permitted Closure, the calculation of the total Construction Closure Deductions or Operating Period Closure Deductions, as the case may be, that accrued in respect of such Non-Permitted Closure; and

(C) all of the steps taken by Developer as referred to in Section 2.1(b)(ii)(B) of this Part 6 during the subsistence of such Non-Permitted Closure or Excused Closure and the measures that have been, and will be, taken to prevent the reoccurrence of similar Non-Permitted Closures or Excused Closures.

2.2 The database shall also record on a real-time basis:

(a) the cumulative number of Noncompliance Points that have accrued and cumulative number of relevant Noncompliance Events that have occurred in such a manner as to allow the Parties to establish at any time whether any Noncompliance Default Event or any Increased Oversight Threshold has occurred; and

(b) the cumulative amount of Construction Closure Deductions and Operating Period Closure Deductions that have accrued in such a manner as to allow the Parties to establish at any time whether any Closure Default Event has occurred.

2.3 Developer shall provide to the Enterprises unrestricted electronic access to the Noncompliance and Closure Database at all times and the database shall be designed to enable the Enterprises to:

(a) inspect all entries by Developer;

(b) flag a request for further information from Developer related to any entry;

(c) flag any entry where the Enterprises dispute the entry;

(d) enter information in respect of each Noncompliance Event and Non-Permitted Closure notified to Developer by the Enterprises pursuant to Section 1.2(a) of this Part 6 to the same level of detail as Developer is required to enter in respect of Noncompliance Events and Non-Permitted Closures notified by it to the Enterprises pursuant to Section 1.1(a) of this Part 6;

(e) record for each Noncompliance Event or Non-Permitted Closure the issuance of a notice by the Enterprises pursuant to Section 1.2(a) of this Part 6;

(f) automatically generate a report recording the number and details of:

(i) Noncompliance Events that have been cured and remain uncured; and

(ii) Non-Permitted Closures and Excused Closures that have ended and are continuing,

in either case, including:

(iii) separate counts of:

(A) Noncompliance Events, Non-Permitted Closures and Excused Closures notified by Developer pursuant to Section 1.1(a) of this Part 6; and

(B) Noncompliance Events and Non-Permitted Closures notified by the Enterprises pursuant to Section 1.2(a) of this Part 6; and

(iv) the number of Noncompliance Points, Construction Closure Deductions and Operating Period Closure Deductions:

(A) accrued by Developer; and

(B) subject to dispute by either Party,

in any such case, within any user-defined time period; and

(g) flag the Enterprises' concurrence or otherwise that the Noncompliance Rectification Time has occurred in respect of Noncompliance Event or a Non-Permitted Closure has ended.

APPENDIX A
Noncompliance Points Tables

Any single failure that constitutes a Noncompliance Event pursuant to more than one item in Table 6A-1 or Table 6A-2 shall be deemed only to constitute a Noncompliance Event pursuant to the item that is more specific to such failure. In the event of any ambiguity as to which Noncompliance Event is more specific to a failure, Section 2.4.3 of the Project Agreement shall apply.

For certainty, if an act, omission, event or other circumstance gives rise to more than one failure each of which constitutes a Noncompliance Event, all provisions of this Agreement that apply as a result of the occurrence of each such Noncompliance Event shall apply without limitation or prejudice to the provisions of this Agreement that apply as a result of the occurrence of any other such Noncompliance Event.

Table 6A.1 - Construction Period Noncompliance Events

Ref	Activity Type	Heading	Noncompliance Event – Failure to:	Cure Period (Calendar Days, except where specified otherwise)	Grace Period (Calendar Days)	Number of Points
1.1	Developer's Management Process	Updates to the Project Management Plan (PMP)	Carry out and submit to the Department updates to the Project Management Plan at times and in the manner prescribed in the Project Management Plan and in accordance with Section 2.2.1 of Schedule 8 (*Project Administration*).	7	N/A	1
1.2	Developer's Management Process	Compliance with PMP	Establish, maintain, and comply with any provision of the Project Management Plan as described in Section 2 of Schedule 8 (*Project Administration*).	7	7	2
1.3	Developer's Management Process	Compliance with QMP	Establish, maintain, update and comply with any provision of the Quality Management Plan as described in Section 6 of Schedule 8 (*Project Administration*).	7	7	2

Table 6A.1 - Construction Period Noncompliance Events

Ref	Activity Type	Heading	Noncompliance Event – Failure to:	Cure Period (Calendar Days, except where specified otherwise)	Grace Period (Calendar Days)	Number of Points
1.4	Developer's Management Process	Compliance with Safety Plan	Establish, adhere to or enforce a safety policy, procedure, process, or guideline as required by the Safety Management Plan as described in Section 7 of Schedule 8 (*Project Administration*).	2	N/A	2
1.5	Developer's Management Process	Environmental Compliance Work Plan (ECWP)	Establish, maintain, and comply with a complete ECWP and any provision as described in Section 2 of Schedule 17 (*Environmental Requirements*).	7	7	2
1.6	Developer's Management Process	Comply with Document Control System	Comply with the requirements of the Document Control System (DCS) in accordance with Section 13 of Schedule 8 (*Project Administration*).	2	N/A	1
1.7	Reserved					

Table 6A.1 - Construction Period Noncompliance Events

Ref	Activity Type	Heading	Noncompliance Event – Failure to:	Cure Period (Calendar Days, except where specified otherwise)	Grace Period (Calendar Days)	Number of Points
1.8	Developer's Management Process	Employment of Key Personnel	Cause the continuous employment in connection with the Work of any of the Key Personnel required to be employed during the Construction Period complying with the qualifications requirements or the time periods specified in Schedule 27 (*Key Personnel*).	14	21	5
1.9	Developer's Management Process	Licensing of Key Personnel	Submit documentation demonstrating compliance with qualification requirements with regard to Key Personnel as described in Schedule 27 (*Key Personnel*).	7	7	1

Table 6A.1 - Construction Period Noncompliance Events

Ref	Activity Type	Heading	Noncompliance Event – Failure to:	Cure Period (Calendar Days, except where specified otherwise)	Grace Period (Calendar Days)	Number of Points
1.10	Developer's Management Process	Public Meetings and Communication	Prepare, maintain and implement the Construction Period Communications Plan (the requirements for which are detailed in Section 5 of Schedule 14 (*Strategic Communications*)) or the Crisis Communications Plan (the requirements for which are detailed in Section 7 of Schedule 14 (*Strategic Communications*)).	1	N/A	2
1.11	Developer's Management Process	Administrative process for Meetings	Conduct, attend or follow specified process in connection with any meeting during the Construction Period as described in Schedule 8 (*Project Administration*) including providing notification to the Department of the meeting details.	N/A	N/A	1

Table 6A.1 - Construction Period Noncompliance Events

Ref	Activity Type	Heading	Noncompliance Event – Failure to:	Cure Period (Calendar Days, except where specified otherwise)	Grace Period (Calendar Days)	Number of Points
1.12	Deliverables	General Deliverables	Prepare, implement, maintain, update or submit any plan, report, deliverable or other Deliverable in accordance with the provisions of this Agreement.	14	7	1
1.13	Deliverables	General Deliverables	Address or resolve the Department's comments with respect to any Deliverable (excluding any Deliverable specified in Section 9(a) and 9(b) of Schedule 9 (*Submittals*)), prior to the next submittal of the Deliverable in accordance with Schedule 9 (*Submittals*).	14	7	1

Table 6A.1 - Construction Period Noncompliance Events

Ref	Activity Type	Heading	Noncompliance Event – Failure to:	Cure Period (Calendar Days, except where specified otherwise)	Grace Period (Calendar Days)	Number of Points
1.14	Deliverables	Noncompliance and Closure Reporting	Provide accurate, complete and timely reporting of (i) any Noncompliance Event and the Noncompliance Points accrued in respect of such Noncompliance Event, or (ii) any Non-Permitted Closure and the Construction Closure Deductions accrued in respect of such Non-Permitted Closure, in any such case, as required by Section 1.1 of Part 6 of this Schedule 6.	N/A	N/A	1
1.15	Project Delivery and Deliverables	Federal and State Requirements	Comply in a timely, accurate and complete manner with any of the Developer's obligations (including any of the reporting requirements) contained in Schedule 15 (*Federal and State Requirements*) but, for certainty, excluding any failure described in Section 1.3.1 of Schedule 15 (*Federal and State Requirements*).	14	7	2

Table 6A.1 - Construction Period Noncompliance Events

Ref	Activity Type	Heading	Noncompliance Event – Failure to:	Cure Period (Calendar Days, except where specified otherwise)	Grace Period (Calendar Days)	Number of Points
1.16	Deliverables	Submit insurance records	Submit documents verifying insurance coverage and payment of insurance premiums and renewals in accordance with Section 25 of the Project Agreement.	10	N/A	2
1.17	Deliverables	Monthly Deductions Report	Submit a Monthly Deductions Report pursuant to Section 2.1 of Part 1 of Schedule 4 (*Payments*) or Section 4(b)(ii) of Schedule 5 (*Milestone Payments*).	7	N/A	1
1.18	Reserved					
1.19	Reserved					

Table 6A.1 - Construction Period Noncompliance Events

Ref	Activity Type	Heading	Noncompliance Event – Failure to:	Cure Period (Calendar Days, except where specified otherwise)	Grace Period (Calendar Days)	Number of Points
1.20	Deliverables	Governmental Approvals and Permits	Deliver to the Department: (a) any documentation required to be submitted pursuant to Section 8.4.3 of the Project Agreement; or (b) copies of new or amended Governmental Approvals or Permits obtained in accordance with Section 8.4 of the Project Agreement.	7	7	1
1.21	Deliverables	Record keeping for Utilities	Make records relating to Utilities available as required by Section 4 of Schedule 10 (*Design and Construction Requirements*).	7	7	2

Table 6A.1 - Construction Period Noncompliance Events

Ref	Activity Type	Heading	Noncompliance Event – Failure to:	Cure Period (Calendar Days, except where specified otherwise)	Grace Period (Calendar Days)	Number of Points
1.22	Deliverables	Materials testing records	Submit to the Department records of materials testing and information to the Department's Quality Records Database in accordance with the requirements of Section 6.4.3 of Schedule 8 (*Project Administration*) within the specified time periods and conforming to the requirements of Section 6 of Schedule 8 (*Project Administration*) and Developer's IQC Program.	2	2	2
1.23	Reserved					

Table 6A.1 - Construction Period Noncompliance Events

Ref	Activity Type	Heading	Noncompliance Event – Failure to:	Cure Period (Calendar Days, except where specified otherwise)	Grace Period (Calendar Days)	Number of Points
1.24	Department Oversight	Inspection and Audit by the Department or Governmental Authorities	Comply with any requirement to provide advance notice, access to Project Records, or otherwise ensure Reasonable Efforts to support the Department or any Governmental Authority with regard to their rights to audit, review, inspection, or testing in accordance with Section 21 of the Project Agreement.	5	2	3
1.25	Department Oversight	Provision of access to Project Records	Keep, maintain, permit access or make available to the Department at the specified location, within specified time of request and for the specified retention period, any Project Record as required by Section 19 of the Project Agreement.	5	2	1

Table 6A.1 - Construction Period Noncompliance Events

Ref	Activity Type	Heading	Noncompliance Event – Failure to:	Cure Period (Calendar Days, except where specified otherwise)	Grace Period (Calendar Days)	Number of Points
1.26	Department Oversight	Department Safe Access to Site and other off-Site locations	Provide safe physical access for the representatives of the Enterprises or the Department, to the Site or where materials are to be inspected, at an off-Site location and to Developer's project field offices in connection with the Work and all inspections as required by Schedule 8 (*Project Administration*).	2	N/A	4
1.27	Department Oversight	Department Facilities	Comply with any of the requirements of Section 11 of Schedule 8 (*Project Administration*) regarding the provision of offices and equipment for the Department.	7	7	1
1.28	Department Oversight	Increased Oversight	Comply with any Approved remedial plan required in accordance with the need for increased oversight by the Department as detailed in Section 21.3 of the Project Agreement.	7	N/A	4

Table 6A.1 - Construction Period Noncompliance Events

Ref	Activity Type	Heading	Noncompliance Event – Failure to:	Cure Period (Calendar Days, except where specified otherwise)	Grace Period (Calendar Days)	Number of Points
1.29	Notification by Developer	Recognized Hazardous Materials	Comply with the Developer's reporting or notification obligations under Schedule 17 (*Environmental Requirements*) in respect of Recognized Hazardous Materials.	N/A	1	3
1.30	Notification by Developer	Notification of Environmental breach	Notify the Department of any breach by Developer of any Environmental Laws, Governmental Approvals or any of the Environmental Requirements.	N/A	1	1
1.31	Notification by Developer	Utility Owner Compliance	Promptly notify the Department (i) if any Utility Owner fails to comply with its respective URA or (ii) in accordance with Developer's notification obligations pursuant to Section 4.5.1 of Schedule 10 (*Design and Construction Requirements*).	N/A	7	1

Table 6A.1 - Construction Period Noncompliance Events

Ref	Activity Type	Heading	Noncompliance Event – Failure to:	Cure Period (Calendar Days, except where specified otherwise)	Grace Period (Calendar Days)	Number of Points
1.32	Notification by Developer	CDPS-SCP and MS4 requirements	Notify to the Department and the applicable Governmental Authority Developer's failure to comply with CDPS-SCP and MS4 requirements (including, but not limited to: failure to comply with BMP, incomplete SWMP, or failure to correctly implement the SWMP).	N/A	1	3
1.33	Notification by Developer	Railroad Compliance	Promptly notify the Department regarding the compliance of Railroads with their respective RRAs during the Construction Period in accordance with Section 10 of Schedule 10 (*Design and Construction Requirements*).	N/A	7	1

Table 6A.1 - Construction Period Noncompliance Events

Ref	Activity Type	Heading	Noncompliance Event – Failure to:	Cure Period (Calendar Days, except where specified otherwise)	Grace Period (Calendar Days)	Number of Points
1.34	Project Delivery	Maintenance of Traffic Requirements	Perform Work in compliance with Developer's obligations or commitments (other than those obligations in respect of lane Closures or Closures which are subject to Construction Closure Deductions in accordance with this Schedule 6) in respect of maintenance of traffic as set out in Section 2 of Schedule 10 (*Design and Construction Requirements*) , Developer's Maintenance Management Plan and Developer's Transportation Management Plan (TMP) including Temporary Traffic Control Plan (TCP) Strategies, Transportation Operations (TOP) Strategies, and Public Information (PI) Strategies (including all maintenance of traffic requirements associated with the Swansea School).	2 hours	N/A	3

Table 6A.1 - Construction Period Noncompliance Events

Ref	Activity Type	Heading	Noncompliance Event – Failure to:	Cure Period (Calendar Days, except where specified otherwise)	Grace Period (Calendar Days)	Number of Points
1.35	Project Delivery	Deliverable Compliance	Comply with any requirement applicable to, or obligation of Developer associated with, a Deliverable set out in Table 2 of Schedule 8 (*Project Administration*) required to be submitted during the Construction Period.	7	7	2
1.36	Project Delivery	Maintain Utility Service	Maintain a Utility fully operational except as specifically permitted by the Utility Owner and by any affected property in accordance with Section 4.2.9 of Schedule 10 (*Design and Construction Requirements*).	2	N/A	3

Table 6A.1 - Construction Period Noncompliance Events

Ref	Activity Type	Heading	Noncompliance Event – Failure to:	Cure Period (Calendar Days, except where specified otherwise)	Grace Period (Calendar Days)	Number of Points
1.37	Project Delivery	CDPS-SCP and MS4 requirements	Comply with CDPS-SCP and MS4 requirements, and the Environmental Requirements referenced in Appendix A of Schedule 17 (*Environmental Requirements*) Revision of Section 208.09 (including, but not limited to: failure to comply with BMP, incomplete SWMP, or failure to correctly implement the SWMP).	1	2	4
1.38	Project Delivery	Right-of-Way Requirements	Perform Work in compliance with any of Developer's obligations as set out in Schedule 18 (*Right-of-Way*).	N/A	N/A	3
1.39	Project Delivery	Courtesy Patrol Services	Comply with any provision of Section 10 of, and Appendix B to, Schedule 11 (*Operations and Maintenance Requirements*), excluding the General Requirements in relation to the Courtesy Patrol Services in Appendix A-1 to Schedule 11, *(Operations and Maintenance Requirements)*.	7	N/A	1

Table 6A.1 - Construction Period Noncompliance Events

Ref	Activity Type	Heading	Noncompliance Event – Failure to:	Cure Period (Calendar Days, except where specified otherwise)	Grace Period (Calendar Days)	Number of Points
1.40	O&M Defects	Timely Remedy of Category 1 Defect	Remedy a Category 1 Defect (Immediate Action) within the Defect Remedy Period.	Defect Remedy Period	N/A	3
1.41	Reserved					
1.42	O&M Defects	Timely Remedy of Category 2 Defect	Remedy a Category 2 Defect (Permanent Repair) (for certainty, other than in an Excluded Element) within the Defect Remedy Period.	1	N/A	1
1.43	O&M Defects	Prevent occurrence of Defect	Prevent a Category 2 Defect (for certainty, other than in an Excluded Element) from deteriorating into a Category 1 Defect.	N/A	N/A	1
1.44	Reserved					

Table 6A.1 - Construction Period Noncompliance Events

Ref	Activity Type	Heading	Noncompliance Event – Failure to:	Cure Period (Calendar Days, except where specified otherwise)	Grace Period (Calendar Days)	Number of Points
1.45	Nonconforming Work	Deliverables	Submit an updated NCR in accordance with Section 6.5.2 of Schedule 8 (*Project Administration*) within five Working Days after submission of an initial NCR in accordance with Section 6.5.1 of Schedule 8 (*Project Administration*).	5	N/A	2
1.46	Nonconforming Work	Deliverables	Submit a NCR in accordance with Section 6.5.7 of Schedule 8 (*Project Administration*) within five Working Days of issuance of a NCN by the Department in accordance with Section 6.5.6 of Schedule 8 (*Project Administration*).	5	N/A	2
1.47	Reserved					

Table 6A.1 - Construction Period Noncompliance Events

Ref	Activity Type	Heading	Noncompliance Event – Failure to:	Cure Period (Calendar Days, except where specified otherwise)	Grace Period (Calendar Days)	Number of Points
1.48	Notification by Developer	ITS Outage	Provide notification within the time period specified in Section 3 of Schedule 10 (*Design and Construction Requirements*) for any planned ITS outage	N/A	N/A	1
1.49	Project Delivery	ITS Outage	Restore ITS functionality or power for any planned ITS outage by the time specified in Section 3 of Schedule 10 (*Design and Construction Requirements*).	5	N/A	1
1.50	Project Delivery	ITS Outage	Maintain ITS network communications or device functionality resulting in an unplanned ITS outage identified in Section 3 of Schedule 10 (*Design and Construction Requirements*).	1	N/A	1
1.51	Project Delivery	Environmental Requirements	Comply with the requirements of Environmental Laws or any of the Environmental Requirements as they relate to exceedance of permitted thresholds as required by applicable Law and all relevant Governmental Approvals.	2	2	2

Table 6A.1 - Construction Period Noncompliance Events

Ref	Activity Type	Heading	Noncompliance Event – Failure to:	Cure Period (Calendar Days, except where specified otherwise)	Grace Period (Calendar Days)	Number of Points
1.52	Developer's Management Process	Compliance with MMP	Establish, maintain, update and comply with any provision of the Maintenance Management Plan as described in Section 5 of Schedule 11 (*Operations and Maintenance Requirements*).	7	7	2
1.53	Developer's Management Process	Compliance with OMP	Establish, maintain, update and comply with any provision of the Operations Management Plan as described in Section 9 of Schedule 11 (*Operations and Maintenance Requirements*).	7	7	2
1.54	Reserved					
1.55	Reserved					
1.56	Project Delivery	Deliverable Compliance	Comply with any requirement applicable to, or obligation of Developer associated with, a Deliverable set out in Section 14 of Schedule 11 (*Operations and Maintenance Requirements*).	7	7	2

Table 6A.1 - Construction Period Noncompliance Events

Ref	Activity Type	Heading	Noncompliance Event – Failure to:	Cure Period (Calendar Days, except where specified otherwise)	Grace Period (Calendar Days)	Number of Points
1.57	Deliverables	Maintenance Reporting	Provide a complete, accurate and timely Annual O&M Report as required by Section 13.2 of Schedule 11 (*Operations and Maintenance Requirements*).	14	7	1
1.58	Deliverables	Renewal Work Plan	Provide or revise an accurate and complete Renewal Work Plan and corresponding annual and five year work schedules as required by Section 6 of Schedule 11 (*Operations and Maintenance Requirements*).	14	7	2
1.59	Deliverables	Maintenance Reporting	Provide a complete, accurate and timely Monthly O&M Report as required by Section 13.1 of Schedule 11 (*Operations and Maintenance Requirements*).	7	N/A	1
1.60	Project Delivery	Subcontracting Requirements	Meet the requirements of Section 17.5 of the Project Agreement.	7	3	1

Table 6A.1 - Construction Period Noncompliance Events

Ref	Activity Type	Heading	Noncompliance Event – Failure to:	Cure Period (Calendar Days, except where specified otherwise)	Grace Period (Calendar Days)	Number of Points
1.61	Project Delivery	Punch List	Prepare, maintain or timely deliver in accordance with Part 7 of Schedule 3 (*Commencement and Completion Mechanics*) a Punch List as required during the Construction Period (or a modification thereto) containing all items of Work to be completed, corrected, adjusted or modified.	7	N/A	4
1.62	Developer's Management Process	Updates to the Environmental Compliance Work Plan (ECWP) and Environmental Status Report (ESR)	Carry out and submit to the Department updates to the ECWP and ESR at times and in the manner prescribed in the Project Management Plan and in accordance with Section 2.1.2 of Schedule 17 (*Environmental Requirements*), and Section 2.2.1 of Schedule 8 (*Project Administration*).	7	7	1

Table 6A.1 - Construction Period Noncompliance Events

Ref	Activity Type	Heading	Noncompliance Event – Failure to:	Cure Period (Calendar Days, except where specified otherwise)	Grace Period (Calendar Days)	Number of Points
1.63	Nonconforming Work	Deliverables	Submit a NCR in accordance with Section 6.5.1 of Schedule 8 (*Project Administration*) within 24 hours after Developer first becomes aware of the Nonconforming Work.	1	N/A	2
1.64	Nonconforming Work	Nonconforming Work Remedy	Complete a Nonconforming Work Remedy within the Approved timeframe.	7	N/A	2
1.65	Nonconforming Work	Corrective Action	Complete any Corrective Action within the timeframe identified in the Approved Corrective Action Plan	7	N/A	1
1.66	Developer's Management Process	Updates to the Safety Plan	Carry out and submit to the Department updates to the Safety Plan at times and in the manner prescribed in the Safety Plan and in accordance with Section 7.3.1.k of Schedule 8 (*Project Administration*)	7	N/A	1

Table 6A.1 - Construction Period Noncompliance Events

Ref	Activity Type	Heading	Noncompliance Event – Failure to:	Cure Period (Calendar Days, except where specified otherwise)	Grace Period (Calendar Days)	Number of Points
1.67	Notification by Developer	Air Quality	Comply with the Developer's reporting or notification obligations under Schedule 17 (*Environmental Requirements*) in respect of Air Quality.	N/A	1	3

Table 6A.2 – Operating Period Noncompliance Events

Ref	Activity Type	Heading	Noncompliance Event – Failure to:	Cure Period (days)	Grace Period (days)	Number of Points
2.1	Developer's Management Process	Updates to the Project Management Plan (PMP)	Carry out and submit to the Department updates to the Project Management Plan at times and in the manner prescribed in the Project Management Plan and in accordance with Section 2.2.1 of Schedule 8 (*Project Administration*).	7	N/A	1
2.2	Developer's Management Process	Compliance with PMP	Maintain, or comply with any provision of the Project Management Plan (PMP) as described in Section 2 of Schedule 8 (*Project Administration*).	7	7	2
2.3	Developer's Management Process	Compliance with Safety Plan	Adhere to or enforce a safety policy, procedure, process, or guideline as required by the Safety Plan as described in Section 7 of Schedule 8 (*Project Administration*).	2	N/A	4
2.4	Developer's Management Process	Environmental Compliance Work Plan (ECWP)	Implement, maintain and comply with any provision of the ECWP as described in Section 2 of Schedule 17 (*Environmental Requirements*).	7	7	2
2.5	Developer's Management Process	Comply with Document Control System	Comply with the requirements of the Document Control System (DCS) in accordance with Section 13 of Schedule 8 (*Project Administration*).	2	N/A	2
2.6	Developer's Management Process	Maintenance Management System (MMIS)	Maintain, update and comply with any requirement related to the Maintenance Management Information System (MMIS) as set out in Section 7 of Schedule 11 (*Operations and Maintenance*).	7	7	2

Table 6A.2 – Operating Period Noncompliance Events

Ref	Activity Type	Heading	Noncompliance Event – Failure to:	Cure Period (days)	Grace Period (days)	Number of Points
2.7	Developer's Management Process	Administrative process for Meetings	Conduct, attend or follow specified process in connection with any meeting during the Operating Period as described in Schedule 11 (*Operations and Maintenance*) including providing notification to the Department of the meeting details.	N/A	N/A	1
2.8	Developer's Management Process	Updates to the Performance Requirements	Provide timely, accurate and complete updates to the Performance Requirements in accordance with Section 4.2.7 of Schedule 11 (*Operations and Maintenance*).	14	7	1
2.9	Developer's Management Process	Employment of Key Personnel	Cause the continuous employment in connection with the O&M Work of any of the Key Personnel required to be employed during the Operating Period complying with the qualifications requirements or the time periods specified in Schedule 27 (*Key Personnel*).	14	21	1
2.10	Developer's Management Process	Licensing of Key Personnel	Submit documentation demonstrating compliance with qualification requirements with regard to Key Personnel in accordance with Schedule 27 (*Key Personnel*).	7	7	1

Table 6A.2 – Operating Period Noncompliance Events

Ref	Activity Type	Heading	Noncompliance Event – Failure to:	Cure Period (days)	Grace Period (days)	Number of Points
2.11	Developer's Management Process	Strategic Communication Plans	Prepare, maintain and implement the Maintenance and Operations Communications Plan (the requirements for which are detailed in Section 6 of Schedule 14 (*Strategic Communications*)) or the Crisis Communications Plan (the requirements for which are detailed in Section 7 of Schedule 14 (*Strategic Communications*)).	1	N/A	2
2.12	Deliverables	General Deliverables	Prepare, implement, maintain, update or submit any plan, report, deliverable or other Deliverable during the Operating Period in accordance with this Agreement.	14	7	1
2.13	Deliverables	General Deliverables	Address or resolve the Department's comments with respect to any Deliverable (excluding any Deliverable specified in Section 9(a) and 9(b) of Schedule 9 (*Submittals*)) prior to the next submittal of the Deliverable in accordance with Schedule 9 (*Submittals*).	14	7	1
2.14	Deliverables	Maintenance Reporting	Provide a complete, accurate and timely Monthly O&M Report as required by Section 13.1 of Schedule 11 (*Operations and Maintenance*).	7	N/A	1
2.15	Deliverables	Maintenance Reporting	Provide a complete, accurate and timely Annual O&M Report as required by Section 13.2 of Schedule 11 (*Operations and Maintenance*).	14	7	1

Table 6A.2 – Operating Period Noncompliance Events

Ref	Activity Type	Heading	Noncompliance Event – Failure to:	Cure Period (days)	Grace Period (days)	Number of Points
2.16	Deliverables	Noncompliance and Closure Reporting	Provide accurate, complete and timely reporting of (i) any Noncompliance Events and the Noncompliance Points accrued in respect of such Noncompliance Event, or (ii) any Non-Permitted Closure and the Operating Period Closure Deductions accrued in respect of such Non-Permitted Closure, in any such case as required by Section 1 of Part 6 of this Schedule 6.	14	N/A	2
2.17	Deliverables	Renewal Work Plan	Provide or revise an accurate and complete Renewal Work Plan and corresponding annual and five year renewal work schedules as required by Section 6 of Schedule 11 (*Operations and Maintenance*).	14	N/A	2
2.18	Deliverables	Handback Reserve Account	Provide any report setting forth accurate and complete calculations of the Handback Reserve Amount in accordance with Section 4 of Schedule 12 (*Handback Requirements*).	14	N/A	2
2.19	Project Delivery and Deliverables	Federal and State Requirements	Comply in a timely, accurate and complete manner with any of the Developer's obligations (including any of the reporting requirements) contained in Schedule 15 (*Federal and State Requirements*) but, for certainty, excluding any failure described in Section 1.3.2 of Schedule 15 (*Federal and State Requirements*).	14	7	2

Table 6A.2 – Operating Period Noncompliance Events

Ref	Activity Type	Heading	Noncompliance Event – Failure to:	Cure Period (days)	Grace Period (days)	Number of Points
2.20	Deliverables	Governmental Approvals and Permits	Deliver to the Department: (a) any documentation required to be submitted pursuant to Section 8.4.3 of the Project Agreement; or (b) copies of new or amended Governmental Approvals or Permits obtained in accordance with Section 8.4 of the Project Agreement.	7	7	1
2.21	Deliverables	Submit insurance records	Submit documents verifying insurance coverage and payment of insurance premiums and renewals in accordance with Section 25 of the Project Agreement.	10	N/A	2
2.22	Deliverables	Monthly Report	Submit a Monthly Deductions Report pursuant to Section 3.1 of Part 2 of Schedule 4 (*Payments*).	N/A	N/A	1
2.23	Deliverables	Residual Life Methodology Report	Prepare and submit a timely, accurate and complete Residual Life Methodology Report in accordance with Section 3.3 of Schedule 12 (*Handback Requirements*).	7	N/A	1
2.24	Deliverables	Handback Inspection and Report	Conduct Handback Inspections or prepare and submit a timely and complete Handback Inspection Reports in accordance with Section 3 of Schedule 12 (*Handback Requirements*).	7	N/A	1

Table 6A.2 – Operating Period Noncompliance Events

Ref	Activity Type	Heading	Noncompliance Event – Failure to:	Cure Period (days)	Grace Period (days)	Number of Points
2.25	Department Oversight	Inspection and Audit by the Department or Governmental Entities	Comply with any requirements to provide advance notice, access to Project Records, or otherwise ensure Reasonable Efforts to support the Department or any Governmental Authority with regard to their rights to audit, review, inspect, or conduct tests in accordance with Section 21 of the Project Agreement.	5	N/A	1
2.26	Department Oversight	Provision of access to Project Records	Keep, maintain, permit access or make available to the Department at the specified location, within specified time of request and for the specified retention period, any Project Record as required by Section 19 of the Project Agreement.	5	N/A	1
2.27	Department Oversight	Department Safe Access to Site and other off-Site locations	Provide safe physical access for representatives of the Enterprises or the Department to the Site or where materials are to be inspected, at an off-Site location and to Developer's project field offices in connection with the O&M Work After Construction and all inspections as required by Schedule 11 (*Operations and Maintenance Requirements*) and Schedule 12 (*Handback Requirements*).	2	N/A	4

Table 6A.2 – Operating Period Noncompliance Events

Ref	Activity Type	Heading	Noncompliance Event – Failure to:	Cure Period (days)	Grace Period (days)	Number of Points
2.28	Department Oversight	Increased Oversight	Comply with any Approved remedial plan required in accordance with the need for increased oversight by the Department as detailed in Section 21.3 of the Project Agreement.	7	N/A	4
2.29	Project Delivery	CDPS-SCP and MS4 requirements	Comply with CDPS-SCP and MS4 requirements, and the Environmental Requirements referenced in Appendix A to Schedule 17, Revision of Section 208.09 (including, but not limited to: failure to comply with BMP, incomplete SWMP, or failure to correctly implement the SWMP).	1	2	4
2.30	Project Delivery	Courtesy Patrol Services	Comply with any provision of Section 10 of, and Appendix B to, Schedule 11 (*Operations and Maintenance Requirements*), excluding the General Requirements in relation to the Courtesy Patrol Services in Appendix A-2 to Schedule 11, *(Operations and Maintenance Requirements)*.	7	N/A	1
2.31	Project Delivery	Punch List	Prepare, maintain or timely deliver in accordance with Part 7 of Schedule 3 (*Commencement and Completion Mechanics*) a Punch List (or a modification thereto) containing all items of Work to be completed, corrected, adjusted or modified.	7	N/A	4

Table 6A.2 – Operating Period Noncompliance Events

Ref	Activity Type	Heading	Noncompliance Event – Failure to:	Cure Period (days)	Grace Period (days)	Number of Points
2.32	Project Delivery	Final Acceptance	Achieve Final Acceptance prior to the Final Acceptance Deadline.	5	N/A	15
2.33	Notification by Developer	CDPS-SCP and MS4 requirements	Notify to the Department and the applicable Governmental Authority Developer's failure to comply with CDPS-SCP and MS4 requirements (including, but not limited to: failure to comply with BMP, incomplete SWMP, or failure to correctly implement the SWMP).	N/A	1	2
2.34	Notification by Developer	Recognized Hazardous Materials	Comply with the Developer's reporting or notification obligations under Schedule 17 (*Environmental Requirements*) in respect of Recognized Hazardous Materials.	N/A	1	3
2.35	Notification by Developer	Notification of Environmental Breach	Notify the Department of any breach by Developer of any Environmental Laws, Governmental Approvals, or any of its Environmental Requirements.	N/A	1	1
2.36	Inspections, Defects and Standards	Timely and accurate Inspections	Perform timely and accurate inspections in accordance with Schedule 10 (*Design and Construction Requirements*) in respect of Renewal Work or Schedule 11 (*Operations and Maintenance Requirements*) in respect of O&M Work that is the subject of the inspections identified in such Schedule 11 (*Operations and Maintenance Requirements*).	7	N/A	1

Table 6A.2 – Operating Period Noncompliance Events

Ref	Activity Type	Heading	Noncompliance Event – Failure to:	Cure Period (days)	Grace Period (days)	Number of Points
2.37	O&M Defects	Timely Remedy of Category 1 Defect	Remedy a Category 1 Defect (Immediate Action) within the Defect Remedy Period.	Defect Remedy Period	N/A	4
2.38	Reserved					
2.39	O&M Defects	Timely Remedy of Category 2 Defect	Remedy a Category 2 Defect (Permanent Repair) (for certainty, other than in an Excluded Element) within the Defect Remedy Period.	1	N/A	1
2.40	O&M Defects	Prevent occurrence of Defect	Prevent a Category 2 Defect (for certainty, other than in an Excluded Element) from deteriorating into a Category 1 Defect.	N/A	N/A	1
2.41	Project Delivery	Maintenance of Traffic Requirements	Perform O&M Work After Construction in compliance with any of Developer's obligations or commitments (other than those in respect of lane Closures or Closures which are subject to Operating Period Closure Deductions in accordance with this Schedule 6) in respect of maintenance of traffic as set out in Section 2 of Schedule 10 (*Design and Construction Requirements*), Developer's Maintenance Management Plan and Developer's Transportation Management Plan (TMP), including Temporary Traffic Control Plan (TCP) Strategies, Transportation Operations (TOP) Strategies and Public Information (PI) Strategies.	1	N/A	4

Table 6A.2 – Operating Period Noncompliance Events

Ref	Activity Type	Heading	Noncompliance Event – Failure to:	Cure Period (days)	Grace Period (days)	Number of Points
2.42	Project Delivery	Timely Performance of Renewal Work	Perform Renewal Work at the time or in the manner set forth in Developer's Annual Renewal Work Plan and in accordance with the Annual Renewal Work Schedule.	14	7	1
2.43	Reserved					
2.44	Reserved					
2.45	Notification by Developer	ITS Outage	Provide notification within the time period specified in Section 3 of Schedule 10 (*Design and Construction Requirements*)for any planned ITS outage	N/A	N/A	1
2.46	Project Delivery	ITS Outage	Restore ITS functionality or power for any planned ITS outage by the time specified in Section 3 of Schedule 10 (*Design and Construction Requirements*).	5	N/A	1
2.47	Project Delivery	ITS Outage	Maintain ITS network communications or device functionality resulting in an unplanned ITS outage identified in Section 3 of Schedule 10 (*Design and Construction Requirements*).	1	N/A	1
2.48	Project Delivery	Maintain Utility Service	Maintain a Utility fully operational except as specifically permitted by the Utility Owner and by any affected property in accordance with Section 4.2.9 of Schedule 10 (*Design and Construction Requirements*).	2	N/A	4

Table 6A.2 – Operating Period Noncompliance Events

Ref	Activity Type	Heading	Noncompliance Event – Failure to:	Cure Period (days)	Grace Period (days)	Number of Points
2.49	Project Delivery	Environmental Requirements	Comply with the requirements of Environmental Laws or any of the Environmental Requirements as they relate to, exceedance of permitted thresholds, as required by applicable Law and all relevant Governmental Approvals.	2	2	2
2.50	Nonconforming Work	Deliverables	Submit an updated NCR in accordance with Section 6.5.2 of Schedule 8 (*Project Administration*) within five Working Days after submission of an initial NCR in accordance with Section 6.5.1 of Schedule 8 (*Project Administration*).	5	N/A	2
2.51	Nonconforming Work	Deliverables	Submit a NCR in accordance with Section 6.5.7 of Schedule 8 (*Project Administration*) within five Working Days of issuance of a NCN by the Department in accordance with Section 6.5.6 of Schedule 8 (*Project Administration*).	5	N/A	2
2.52	Project Delivery	Deliverable Compliance	Comply with any requirement applicable to, or obligation of Developer associated with, a Deliverable set out in Section 14 of Schedule 11 (*Operations and Maintenance Requirements*).	7	7	2
2.53	Developer's Management Process	Compliance with MMP	Maintain, update and comply with any provision of the Maintenance Management Plan as described in Section 5 of Schedule 11 (*Operations and Maintenance Requirements*).	7	7	2

Table 6A.2 – Operating Period Noncompliance Events

Ref	Activity Type	Heading	Noncompliance Event – Failure to:	Cure Period (days)	Grace Period (days)	Number of Points
2.54	Developer's Management Process	Compliance with OMP	Maintain, update and comply with any provision of the Operations Management Plan as described in Section 9 of Schedule 11 (*Operations and Maintenance Requirements*).	7	7	2
2.55	Developer's Management Process	Compliance with Renewal Works Requirements	Establish, maintain, update and comply with any requirement related to Renewal Work as set out in Section 6 of Schedule 11 (*Operations and Maintenance Requirements*).	7	7	2
2.56	Project Delivery	Deliverable Compliance	Comply with any requirement applicable to, or obligation of Developer associated with, a Deliverable set out in Table 2 of Schedule 8 *(Project Administration*) and effective during the Operating Period.	7	7	2
2.57	Project Delivery	ETC System outage	Prevent interference with, or damage to, the ETC System by any Developer-Related Entity resulting in an unplanned ETC System outage which is only able to be rectified with the involvement of the ETC System Integrator, but which does not result in a Closure of a Tolled Express Lane.	7	N/A	10
2.58	Developer's Management Process	Compliance with QMP	Maintain, update and comply with any provision of the Quality Management Plan during the Operating Period as described in Section 6 of Schedule 8 *(Project Administration*).	7	7	2

Table 6A.2 – Operating Period Noncompliance Events

Ref	Activity Type	Heading	Noncompliance Event – Failure to:	Cure Period (days)	Grace Period (days)	Number of Points
2.59	Deliverables	Record keeping for Utilities	Make records relating to Utilities available as required by Section 4 of Schedule 10 (*Design and Construction Requirements*).	7	N/A	2
2.60	Deliverables	Materials testing records	Submit to the Department records of materials testing and information to the Department's Quality Records Database in accordance with the requirements of Section 6.4.3 of Schedule 8 (*Project Administration*) within the specified time periods and conforming to the requirements of Section 6 of Schedule 8 (*Project Administration*) and Developer's IQC Program.	2	2	3
2.61	Deliverables	Certification	Submit required valid certificates in relation to the O&M Work After Construction in accordance with Section 6.4.3 of Schedule 8 (*Project Administration*).	2	N/A	1
2.62	Reserved					
2.63	Project Delivery	Subcontracting Requirements	Meet the requirements of Section 17.5 of the Project Agreement	7	3	1
2.64	Project Delivery	ETC System outage	Prevent interference with, or damage to, the ETC System by any Developer-Related Entity resulting in an unplanned ETC System outage which is able to be rectified without the involvement of the ETC System Integrator, but which does not result in a Closure of a Tolled	1	N/A	4

Table 6A.2 – Operating Period Noncompliance Events

Ref	Activity Type	Heading	Noncompliance Event – Failure to:	Cure Period (days)	Grace Period (days)	Number of Points
			Express Lane.			
2.65	Developer's Management Process	Updates to the Environmental Compliance Work Plan (ECWP) and Environmental Status Report (ESR)	Carry out and submit to the Department updates to the ECWP and ESR at times and in the manner prescribed in the Project Management Plan and in accordance with Section 2.1.2 of Schedule 17 (*Environmental Requirements*), and Section 2.2.1 of Schedule 8 (*Project Administration*).	7	7	1
2.66	Nonconforming Work	Deliverables	Submit a NCR in accordance with Section 6.5.1 of Schedule 8 (*Project Administration*) within 24 hours after Developer first becomes aware of the Nonconforming Work.	1	N/A	2
2.67	Nonconforming Work	Nonconforming Work Remedy	Complete a Nonconforming Work Remedy within the Approved timeframe.	7	N/A	2
2.68	Nonconforming Work	Corrective Action	Complete any Corrective Action within the timeframe identified in the Approved Corrective Action Plan.	7	N/A	1
2.69	Reserved					
2.70	Reserved					
2.71	Reserved					
2.72	Reserved					

Table 6A.2 – Operating Period Noncompliance Events

Ref	Activity Type	Heading	Noncompliance Event – Failure to:	Cure Period (days)	Grace Period (days)	Number of Points
2.73	Reserved					
2.74	Reserved					
2.75	Reserved					
2.76	Developer's Management Process	Updates to the Safety Plan	Carry out and submit to the Department updates to the Safety Plan at times and in the manner prescribed in the Safety Plan and in accordance with Section 7.3.1.k of Schedule 8 (*Project Administration*)	7	N/A	1
2.77	Notification by Developer	Air Quality	Comply with the Developer's reporting or notification obligations under Schedule 17 (*Environmental Requirements*) in respect of Air Quality.	N/A	1	3

Schedule 7
Compensation on Termination

1. **Compensation on Termination For Convenience and Termination for Enterprise Default**

The Termination Amount payable by the Enterprises to Developer in connection with:

(a) any Termination for Convenience;

(b) any termination of the Project Agreement for Enterprise Default; or

(c) any Termination by Court Ruling that arises by reason of an Enterprise Default,

shall equal the amount calculated at the Termination Date (without double-counting) as follows:

(i) the Equity Market Value; *minus*

(ii) the costs and expenses to determine the Equity Market Value in accordance with the process described in the definition thereof, to the extent such costs and expenses were incurred or paid by the Enterprises;

plus (if the amount calculated pursuant to (iii) is positive) or *minus* (if the amount calculated pursuant to (iii) is negative):

(iii) an amount equal to:

(A) Lenders' Liabilities; *plus*

(B) Subcontractor Breakage Costs; *plus*

(C) Developer Employee Redundancy Payments; *minus*

(D) Account Balances; *minus*

(E) Termination Insurance Proceeds; *minus*

(F) any Termination Deduction Amount.

2. **Compensation on Termination by Court Ruling, Termination for Extended Events and Termination for Uninsurable Risk**

The Termination Amount payable by the Enterprises to Developer in connection with:

(a) any Termination by Court Ruling (other than any such termination that arises by reason of a Developer Default or an Enterprise Default);

(b) any Termination for Extended Events; or

(c) any termination of the Project Agreement pursuant to Section 33.1.7 thereof;

shall equal the amount calculated at the Termination Date (without double-counting) as follows:

(i) the greater of:

(A) all amounts paid or disbursed to Developer prior to the Termination Date by:

(I) Equity Members in the form of direct equity investments; and

(II) Equity Members or any of their Affiliates in the form of Equity Member Debt,

minus, an amount equal to all Distributions made by Developer to the Equity Members on or before the Termination Date; and

(B) $0;

plus (if the amount calculated pursuant to (ii) is positive) or *minus* (if the amount calculated pursuant to (ii) is negative):

(ii) an amount equal to:

(A) Lenders' Liabilities; *plus*

(B) Subcontractor Breakage Costs; *plus*

(C) Developer Employee Redundancy Payments; *minus*

(D) Account Balances; *minus*

(E) Termination Insurance Proceeds; *minus*

(F) any Termination Deduction Amount.

3. **Compensation on Termination for Developer Default**

3.1 The Termination Amount payable by the Enterprises to Developer in connection with:

(a) any termination of the Project Agreement for Developer Default; or

(b) any Termination by Court Ruling that arises by reason of a Developer Default,

on or prior to the Substantial Completion Date, shall equal the amount calculated at the Termination Date (without double-counting) as the lesser of:

(i) the Construction Work Value; and

(ii) an amount (whether positive or negative) equal to:

(A) Lenders' Liabilities; *minus*

(B) Account Balances; *minus*

(C) Termination Insurance Proceeds; *minus*

(D) any Termination Deduction Amount.

3.2 The Termination Amount payable by the Enterprises to Developer in connection with:

(a) any termination of the Project Agreement for Developer Default; or

(b) any Termination by Court Ruling that arises by reason of a Developer Default,

after the Substantial Completion Date, shall equal the amount calculated at the Termination Date (without double-counting) as the lesser of:

(i) an amount (whether positive or negative) equal to:

(A) Lenders' Liabilities; *minus*

(B) Maintenance Rectification Costs; *minus*

(C) Account Balances; *minus*

(D) Termination Insurance Proceeds; *minus*

(E) any Termination Deduction Amount; and

(ii) an amount (whether positive or negative) equal to:

(A) 80% of Lenders' Liabilities; *minus*

(B) Account Balances; *minus*

(C) Termination Insurance Proceeds; *minus*

(D) any Termination Deduction Amount.

4. Miscellaneous Compensation Provisions

4.1 Set Off and Deductions on Termination

The Enterprises shall only be entitled to deduct any Termination Deduction Amount when calculating any Termination Amount pursuant to Section 1 or 2 of this Schedule 7 to the extent that, after making such deduction, the Termination Amount payable to Developer would not be less than an amount equal to the Lenders' Liabilities.

4.2 Timing of Payment of Termination Amount

Any Termination Amount shall be due and payable by the Enterprises 180 Calendar Days after the Termination Date.

4.3 Treatment of Negative Termination Amount Calculations

To the extent that any Termination Amount calculated pursuant to this Schedule 7 is calculated to be less than zero, then such Termination Amount shall be deemed to equal zero.

4.4 Calculation of Termination Amount and Lenders' Liabilities

(a) Promptly following:

(i) delivery by either Party of a Termination Notice or any Termination by Court Ruling, as applicable; and

(ii) any Enterprise request for an update to a certificate previously provided by the Collateral Agent pursuant to this Section 4.4(a), such update to be made in anticipation of paying the Termination Amount on a specific date,

Developer shall request that the Collateral Agent provide it and the Enterprises with a certificate (or, as applicable, an update certificate) as to the amounts described in Sections 4.4(b)(i) and 4.4(b)(ii) of this Schedule 7.

(b) The Enterprises shall be entitled to rely on a certificate of the Collateral Agent as conclusive as to the amount of:

(i) the Lenders' Liabilities outstanding at the relevant time (or, as applicable, projected to be outstanding at a future time absent changed circumstances); and

(ii) the amount of any Account Balances with respect to accounts held with the Collateral Agent or any other Lender at the relevant time (or, as applicable, projected to be held at a future time absent changed circumstances).

4.5 Transfer of Key Assets

Developer shall comply with its obligations under Section 34 of the Project Agreement as a condition precedent to the Enterprises' payment of any Termination Amount.

4.6 Gross Up of Termination Amount

(a) If any Termination Amount payable by the Enterprises to Developer pursuant to Section 1 or Section 2 of this Schedule 7 is subject to Applicable Tax, then subject to Section 4.6(b) of this Schedule 7 the Enterprises shall pay to Developer such additional amount of Applicable Tax as the Enterprises reasonably determine will put Developer (or, to the extent that Developer is treated as a pass through entity for Applicable Tax purposes, its Equity Members) in the same after tax position as it would have been in had the payment not been subject to Applicable Tax, taking account of any relief, allowances, deductions, setting off or credits in respect of any Applicable Tax (whether available by choice or not) which may be available to Developer to reduce the Applicable Tax to which the payment is subject.

(b) As a condition to Enterprises' payment to Developer of the amount of Applicable Tax otherwise payable pursuant to this Section 4.6, Developer shall certify to the Enterprises the amount of Applicable Tax Developer believes should be paid pursuant to this Section,

which certification shall include a detailed calculation of such amount together with relevant supporting documentation and information reasonably acceptable to the Enterprises.

Schedule 8
Project Administration

1. GENERAL REQUIREMENTS

The Developer shall be solely responsible for the management and administration of the Work, coordinating all activities necessary to perform the Work, and reporting and documenting all Work and ensuring the quality of the Work in conformance with the Project Agreement. The Developer shall satisfy all functional needs and characteristics of Project administration and this Schedule 8.

2. PROJECT MANAGEMENT PLAN

2.1. General Requirements

2.1.1. The Developer shall submit a Project Management Plan (PMP) that encompasses the Term of the Project Agreement, for Acceptance by the Department, prior to the issuance of NTP1, which is consistent with and expands upon the draft Project Management Plan submitted with the Proposal. The PMP shall provide clear detail of the Developer's overall approach to its team organization, structure, and management processes, and shall describe the scope, goals, and objectives of Project approach and intended results and be fully compliant with all provisions of the Project Agreement. The PMP shall identify by signature page and date, the title of the qualified professionals who are responsible for planning, reviewing, approving, reporting, monitoring, controlling, implementing, revising, and issuing the PMP, including revisions. At a minimum, the PMP shall include the following (where applicable relating to both Developer and its Subcontractors but also, where applicable, clearly identifying the division of roles and responsibilities between the Developer and its Subcontractors):

a. An organizational chart and description, indicating the Developer's overall team structure including all Key Personnel, management staff and their reporting relationships for all Work, and including designation of an individual who is (and whose replacement, if any, shall be) a licensed professional engineer in the State who shall at all times when Construction Work or Renewal Work is being conducted serve as the engineer in responsible charge for the observation of the Construction Work or, as applicable, the Renewal Work;

b. A design organizational chart and description, indicating the roles, responsibilities and structure of the Developer's design staff, down to and including discipline leads and the staff positions proposed in each discipline;

c. A construction organizational chart and description, indicating the roles, responsibilities and structure of the Developer's construction staff, down to and including field superintendents and the staff positions proposed under each field superintendent for the Work for all shifts;

d. A quality management organizational chart and description, indicating the roles, responsibilities and structure of the respective quality management, Process Control and IQC staff, down to and including field inspection, and testing for the Work for all shifts;

e. An Operations and Maintenance (O&M) organizational chart, and description, indicating the roles, responsibilities and structure of the O&M staff, both during the Construction Period and the Operating Period, down to and including the roadway, drainage, bridge, tolling systems and Intelligent Transportation Systems (ITS) discipline leads for any O&M related Work;

f. A design management process, including a description of how design personnel will interface with the Department, construction, quality management and O&M organizations, in accordance with the Schedule 8, Quality Management Plan requirements;

g. A construction management process, including the independence of Process Control (PC) personnel and activities from IQC personnel and activities, interface with the IQC and roles and responsibilities for approvals, Developer's coordination plan, the Developer's management approach, the construction management structure, identification of advanced

Work, detailed delineation of work zones with identification of design and construction packages, and summary of major Project phases;

h. Description of key processes and their reference location within the Developer's Operations Management Plan and Maintenance Management Plan, in accordance with the Schedule 11 requirements, including a description of how design personnel will interface with Developer's construction, Process Control, IQC and O&M organizations in accordance with the Schedule 8, Quality Management Plan requirements, process for inspections and notifications of issues of non-compliance to Department, and processes and timeframe for providing applicable cures for nonconformance;

i. Detailed description of the interface between the design and construction resources and the allocation of design and construction staff to implement the Project;

j. Process for addressing constructability, durability, maintainability and environmental compliance in the Work;

k. Description of key processes and their reference location within the Developer's Durability Plan, in accordance with the requirements in Schedule 8 and to meet the requirements of Schedule 12 Handback Requirements. This will include a description of how design personnel will interface with Developer's construction, Process Control, IQC and O&M organizations in accordance with the Quality Management Plan requirements in Schedule 8 to ensure durability in the design process;

l. Description of key processes and their reference location within the Developer's Quality Management Systems Manual, in accordance with the Schedule 8 requirements, for control of the Release for Construction (RFC) drawings through the Construction Period including making changes to the design during construction and ensuring engineering review of the new design and compliance with the Project Agreement. Processes shall demonstrate how the Department and the Developer's design team are involved in the review and acceptance of deviations from the RFC drawings;

m. Process for construction closeout including the Developer's approach to satisfaction of Milestone Completion Conditions, Substantial Completion Conditions, Final Acceptance Conditions, and management of Punch Lists;

n. Description of key processes, and their reference location within the Developer's Safety Management Plan, in accordance with Schedule 8 requirements, for both employees of Developer and its Subcontractors and the public, including the designation of a full time safety manager, training procedures, description of the subcontractor Health and Safety Plan, accident investigation procedures and exposure assessment;

o. Description of key processes, and their reference location within the Developer's Transportation Management Plan, in accordance with Section 2 of Schedule 10 Maintenance of Traffic requirements, including interface with the Department and the City of Denver (CCD);

p. Description of key processes, and their reference location within the Developer's Strategic Communications Plan, in accordance with the Schedule 14 requirements, including interface with the Department, CCD, Governmental Authorities, regulatory agencies, Utility Owners, Railroads, other stakeholders and the public during the Work, at a minimum the following activities: plans and Permits review; progress, workshops, partnering and Utility coordination meetings; construction engineering and inspection; and public involvement and community input;

q. Description of key processes, and their reference location within the Developer's Environmental Compliance Work Plan, in accordance with the Schedule 17 requirements, including interface with the Department and any Governmental Authority;

r. Description of key processes, and their reference location within the Developer's Property Management Plan, in accordance with the Schedule 18 requirements, including processes

for the security, hazardous materials assessment, demolition, debris removal, site clearing, storm water management improvements, and clean-up of building structures and property improvements acquired as part of the ROW for the Project;

s. Description of key processes for managing the Project's Disadvantaged Business Enterprise (DBE), Emerging Small Business (ESB), and Workforce Development program, and their reference location within their respective Plans, in accordance with the Schedule 15 requirements;

t. Description of the Developer's key processes and approach to the Schedule Work Plan, in accordance with the Schedule 8 requirements, including Schedule maintenance and required Deliverables management, and Supervening Event and Change management procedures; and

u. Developer's approach to non-compliance reporting, evaluation, and resolution with each of its Subcontractors and methodology on how this information will be reported to the Department, including in accordance with the Schedule 6, Part 6 requirements.

2.2. Project Management Plan Updates

2.2.1. The Developer shall monitor and improve the effectiveness of its PMP and resubmit the PMP for Acceptance by the Department annually, upon the anniversary of its initial Acceptance by the Department, or more frequently should any of the following conditions exist:

a. A plan or procedure no longer adequately addresses the matters it was originally intended to address;

b. A plan or procedure does not conform with the Project Agreement;

c. An audit by the Developer or the Department identifies a deficiency in the PMP requiring an update;

d. Organizational structure changes require revision to the PMP;

e. The Developer is undertaking, or about to undertake, activities that are not covered within the current PMP; or

f. The Department requires the PMP to be updated at its request.

2.2.2. The Developer shall clearly identify in a cover sheet what changes were made in a PMP update to expedite the Department's review. Also, a redline copy and a final clean copy shall be submitted to the Department.

3. PROJECT SCHEDULING

3.1. General Requirements

The Department's opinions concerning the various scheduling documents and reports are not controlling over the Developer's independent judgment concerning the means, methods, and sequences of Work that the Developer employs. All Work and activities of the Developer shall be scheduled and monitored by use of a Critical Path Method (CPM) Project Schedule using scheduling software compatible with Primavera P6 v7. Compatible shall mean that the Developer provided electronic file version of the Project Schedule may be loaded or imported by the Department with no modifications, preparation, or adjustments. All scheduling software settings within the scheduling/leveling dialog box shall remain 'default' unless otherwise Approved by the Department. In addition, any changes to the scheduling software settings that alter the scheduling calculations shall be clearly identified and provided as part of the Schedule submittals. The Developer shall provide a Project Schedule for the Work in accordance with this Section 3.

The Developer shall designate a Developer's Scheduler until Final Acceptance. The Developer's Scheduler shall have at least 10 years of previous scheduling experience on similarly sized projects in both scope and complexity (with references to be provided to the Department, upon request). The Developer's Scheduler shall be a certified Planning and Schedule Professional (AACE International PSP Certification). Upon removal or voluntary termination of the Developer's

Scheduler from the Project, the Developer shall provide a qualified replacement within 30 Calendar Days.

3.2. Schedule Work Plan

3.2.1. The Developer shall provide a Schedule Work Plan that addresses all aspects of scheduling the Work and assigns responsibilities to positions within the Developer's organization. The Schedule Work Plan should be based on the description of the overall approach of scheduling the Construction Work provided with the Proposal Schedule. The Schedule Work Plan shall be submitted for Acceptance by the Department, prior to the issuance of NTP1, and shall provide a description of the overall approach of scheduling the Work, including the following:

a. The Developer's approach to development, review, and coordination with the Department for Approval of the Project Schedules;

b. The Developer's organization and specific positions (including field personnel) that will be responsible for developing and progressing the Project Schedules and for PC and IQC of the Project Schedules, the personnel performance responsibilities and Developer coordination internally and with the Department for Project Schedules updates;

c. Developer's approach to updating and maintaining the Project Schedules to reflect the scheduled Work and how the Project Schedule will be utilized to progress the Work; and

d. Developer's approach to tracking the information necessary to update each Monthly Progress Schedule to reflect the exact manner in which the Developer executed the Construction Work.

3.2.2. The Developer may propose or the Department may require updates to the Schedule Work Plan. Changes to the Schedule Work Plan shall be submitted by Developer for Acceptance by the Department.

3.3. Project Schedules

3.3.1. The Work specified in this Section 3.3 includes preparing, progressing, revising, and submitting the Project Schedules.

3.3.2. The Project Schedules shall be developed consistent with the Accepted Work Breakdown Structure (WBS) and shall represent a practical plan to:

a. complete the Work before the Baseline Substantial Completion Date and the Final Acceptance Deadline, as applicable;

b. achieve Milestone Completion of each Payment Milestone before the applicable Milestone Completion Target Date; and

c. convey the intent in the manner of the prosecution and progress of the Work.

3.3.3. The Project Schedules shall include the planned execution of the Work in accordance with the Project Agreement. The Project Schedules shall include seasonal and weather limitations, involvement and coordination with Utility Owners, Railroads, environmental limitations, Right of Way restrictions, traffic limitations, Governmental Authorities, engineers, architects, Subcontractors, and Suppliers, and all other limitations shall be considered in the development of the Baseline Schedule, Revised Baseline Schedule, and updating of subsequent Monthly Progress Schedules. Days scheduled as non-work days shall be indicated. The Project Schedules shall include delivery dates for critical materials, submittal and review periods (which shall be in accordance with the time periods specified in Schedule 9 (*Submittals*) and also take account of any such periods in Exhibit K to the Denver IGA, the URAs, the RRAs and any other Third Party Agreement).

3.3.4. The Project Schedule shall mean any of the following schedules identified in this Section 3.3 *(Project Schedules)*. If any ambiguity exists, which Project Schedule is meant shall be as determined by the Department.

a. Baseline Schedule

i. The Developer shall submit, for Acceptance by the Department, a Baseline Schedule. The Baseline Schedule shall be a CPM Schedule with activity detail to WBS Level VI. The Baseline Schedule shall conform to the Accepted WBS and include all Developer-defined WBS Level IV, V, and VI activities. The Baseline Schedule shall be cost and resource loaded to Level VI.

ii. The Baseline Schedule shall be developed based upon the Proposal Schedule, shall include the dates for the Key Milestones and shall be incorporated into the Project Agreement (such dates for which shall not be changed except by Department Approval). The Baseline Schedule shall detail the Developer's Activities for the Project from NTP1 through Final Acceptance. Activities representing Work during this period shall be sufficiently detailed to plan, monitor, and evaluate the progress of the Work. The Baseline Schedule shall represent conditions of the Project at NTP1.

iii. Once Accepted, the Baseline Schedule shall be the base Project Schedule against which all progress of the Work and the Monthly Progress Schedule shall be assessed. The Baseline Schedule shall not be modified.

b. Revised Baseline Schedule

Any revisions or changes to the Baseline Schedule proposed by the Developer, or required by the Department, shall be incorporated by the Developer into a Revised Baseline Schedule. Each Revised Baseline Schedule is subject to Department Acceptance prior to implementation. Each Revised Baseline Schedule shall have a unique name that includes a sequential revision number from the original Baseline Schedule. The Revised Baseline Schedule shall detail the then-current progress of Work, including the status of all activities, sequencing, and logic changes, and shall represent the Developer's best knowledge and planning at that time. Once Accepted, each Revised Baseline Schedule shall be the basis for all subsequent Monthly Progress Schedules.

c. Float

i. Section 9.2.3 of the Project Agreement shall apply in respect of any Float included in any Project Schedule.

ii. The Developer shall not suppress or consume Float by extending activity duration or including dummy activities. Preferential sequencing shall not be permitted.

iii. The Department shall have the right to examine the identification of, or failure to identify, Float and Controlling Work Items on any Project Schedule in determining whether to Accept such Project Schedule.

3.3.5. Monthly Progress Schedules

a. The Developer shall submit Monthly Progress Schedules with Progress Reports submitted pursuant to Section 4 of this Schedule 8, unless otherwise Approved by the Department. At a minimum, the Monthly Progress Schedule(s) shall include the following current Construction Work data:

i. Detailed Schedule of activities that clearly identify the Critical Path;

ii. Progress for the current period for all activities; and

iii. Actual start and finish dates of activities, physical percent complete, and Calendar Days remaining for activities in progress.

b. The data date for use in calculating the Monthly Progress Schedule shall be the first day of the following month. The Monthly Progress Schedule shall accurately reflect updated progress as of the effective date of the Baseline Schedule or Revised Baseline Schedule, forecast finish for in-progress activities, and reforecast early and late dates for remaining

activities, and shall indicate the overall physical percent complete of the Project. If any actual dates are changed or corrected in any following month, the information must be included in the required monthly narrative to be submitted along with the Monthly Progress Schedule.

c. The Monthly Progress Schedule(s) shall be submitted, for Acceptance, monthly no later than the 10th Working Day of the relevant month, and include additional, separate, filtered lists of activities and Construction Work elements included in the Monthly Progress Schedule to illustrate the following:

   i. Coordination and accomplishment of Construction Work associated with Utilities and Railroads;

   ii. Status of all Key Milestones as compared to the Baseline Schedule or Revised Baseline Schedule planned dates;

   iii. Physical status of all Work as of date of the update;

   iv. Actual progress relative to planned progress, organized by WBS;

   v. Design document submittals for the upcoming period;

   vi. All activities with 14 Calendar Days or less Float;

   vii. 60 Calendar Day look ahead on all required Department Approvals and other applicable third party approvals;

   viii. 90 Calendar Day look ahead sorted by WBS and activity early start dates;

   ix. Critical items for Critical Path sorted by activity late start date; and

   x. Time-scaled critical path network plot indicating the status of all activities as of the date of the update.

d. The Developer may modify a Monthly Progress Schedule with Department Acceptance. The Developer shall provide a list of any proposed changes from the previous Monthly Progress Schedule with a supporting narrative justifying the changes to the Department for Acceptance. The Developer shall describe any changes to the Key Milestones, or any activities that require action or include commitments by the Department, including changes to the dates such activities fall upon in the narrative. If the Department provides comments to any Monthly Progress Schedule, the Developer shall address such comments to the Department's satisfaction prior to submittal of the subsequent Monthly Progress Schedule. The Monthly Progress Schedule shall include all information current as of the data date.

3.3.6. Record Schedule

The final Monthly Progress Schedule submitted shall include all Work completed through Final Acceptance and be identified by the Developer as the Record Schedule. The Record Schedule shall reflect the exact manner in which the Developer executed the Construction Work (including start and finish dates, activities, actual durations, sequences, and logic), and shall be signed and certified by the Developer's Project Manager and the Developer's lead scheduler as being a true reflection of how the Work was executed through Final Acceptance.

3.3.7. Schedule Requirements

a. All Float shall be shown on the Project Schedule on each Schedule path, with the Float in respect of the Critical Path and in respect of each Milestone Completion to be separately and clearly identified.

b. The Project Schedule shall divide the Work into activities with appropriate logic ties to show the Developer's overall approach to planning, scheduling, and executing the Work. The duration and the logical relationships of the activities and summaries at Work phase level shall be based on the actual durations and relationships anticipated. The Developer shall not use calendar dates to "logically" begin or complete any activity unless those specified

calendar dates are identified in the Project Agreement. The Developer shall allow for at least three workshop sessions with the Department during development of the Baseline Schedule and at least one workshop session for each Revised Baseline Schedule. For all Monthly Progress Schedules, the Developer shall meet with the Department at least once per month and as otherwise requested by the Department.

c. The Project Schedule shall accommodate the Right-of-Way Schedule in accordance with Schedule 18 Right-of-Way.

d. The Project Schedule shall accommodate Utility coordination in accordance with Schedule 10, Section 4 Utilities.

e. The Project Schedule shall accommodate Railroad coordination in accordance with Schedule 10, Section 10 Railroads.

f. Schedule Development

All Project Schedules and Monthly Progress Schedules shall:

i. Include the following data:

A. Activity ID;

B. Activity description;

C. Start date (actual start date for started activities);

D. Finish date (actual finish date for completed activities);

E. Original duration;

F. Remaining duration (for those activities started but not completed);

G. Variance from Baseline Schedule or Revised Baseline Schedule start dates;

H. Variance from Baseline Schedule or Revised Baseline Schedule finish dates;

I. Total Float (which shall be separately and clearly identified in respect of the Critical Path and in respect of each Milestone Completion); and

J. Critical Path activities highlighted in red;

ii. Provide sufficient number of activities in the Schedule to assure adequate planning and control of Construction Work, and to permit monitoring and evaluation of progress, and analysis of time impacts;

iii. Use CPM to determine Controlling Work Items of Construction Work. The Developer shall utilize retained logic for calculating all Project Schedules. Out-of-sequence Construction Work shall be itemized and described in monthly Schedule narrative reports and discussed at monthly review meetings. Out-of-sequence Construction Work shall be corrected in order to have the required record schedule;

iv. Show the order in which the Developer plans to perform the Construction Work, with logical ties sufficient to demonstrate the Developer's overall approach to planning, scheduling, and executing the Construction Work;

v. Use activities, with the exception of the first and last activities, that have a minimum of one predecessor and a minimum of one successor activity;

vi. Not use unnecessary logic ties;

vii. Use durations and logical relationships based on the actual durations and relationships anticipated;

viii. Depict the sequence and interdependence of all activities required for the complete performance of the Work, beginning at NTP1 and concluding at Final Acceptance;

ix. Use all, and only, activities which are consistent with the Developer's WBS;

x. Identify all design packages intended to be included as Release for Construction (RFC) Documents, which, at a minimum, shall have logical ties to the submittals and Construction Work anticipated for the respective design package;

xi. Show the phasing of the Construction Work, including RFC Documents, submittal dates, subcontractor Construction Work, procurement, fabrication, preparation of mock-ups, delivery, installation, PC, IQC, testing of materials and equipment, and any long-lead-time (over 60 Calendar Days) orders for materials or equipment;

xii. Include the Key Milestones, which shall each be assigned "finish on or before" constraint dates;

xiii. Depict the required coordination with, and work to be performed by other contractors, including any contractors performing Construction Work within or adjacent to the Site, and work from adjacent projects which may affect the Construction Work, Railroad Work, Utility Owners, third parties, Subcontractors, and Suppliers;

xiv. Depict and account for the acquiring of Permits and Governmental Approvals;

xv. Show all activities, of either the Department or third parties that affect progress of the Work. Include activities identifying Department Approval or Acceptance periods and other actions;

xvi. Contain no activity duration shorter than one Calendar Day, or longer than 30 Calendar Days, except for long lead time material procurements, as long as each phase of the procurement is identified as a specific activity;

xvii. Show Maintenance of Traffic (MOT) Activities;

xviii. Contain no unspecified milestones, Float suppression techniques, or use of activity durations, logic ties, and/or sequences deemed unreasonable by the Department;

xix. Use activities or calendars instead of duration lags, and contain no negative float;

xx. Utilize a unique number and name for each individual activity;

xxi. Not reuse any activity number;

xxii. Include, in electronic and hardcopy format, a graphic representation in the form of a Gantt chart with an activity table of all activities;

xxiii. Comply with all requirements in Schedule 10, Section 2 (*Maintenance of Traffic*) for all Closures documented by indicating the planned or actual start and completion of a Closure using a level-of-effort activity; and

xxiv. Appropriately account for weather.

g. Schedule Management

i. Activities and their durations that represent Department actions or commitments shall be subject to the Approval of the Department. Once Approved, no changes to such activities, nor their start and finish dates, shall be made without Department Approval;

ii. Activity descriptions shall not be changed without Department Approval. Any proposed change to a description shall be clearly identified and discussed at monthly meetings. New activities shall be used to show changes in scope; and

iii. All Project Schedules and time impact analyses shall include a certification by the lead scheduler and Project Manager that the information presented is true and accurate based on information currently known and meets the requirements of the Project Agreement.

h. Schedule Narrative Report

i. The Baseline Schedule shall include a Schedule Narrative Report describing, at a minimum, the Developer's plan and schedule for achieving the Project Agreement requirements and objectives for all Work. The narrative shall describe the methods of operation, resources to be employed, time frames for Project administration, design, and construction, and time frames for accomplishment of specified milestones and Key Milestones. A Resource Plan shall be included, which shall document in detail the types and quantities of resources needed to prosecute all aspects of the Work;

ii. The Revised Baseline Schedule shall include a Schedule Narrative Report describing the Developer's plan and schedule for achieving the remaining Project Agreement requirements and objectives for the Work. The narrative shall include a list of the changes that were made to the Revised Baseline Schedule and why the changes were made. The narrative shall also describe the methods of operation, resources to be employed, time frames for the design and construction, and time frames for accomplishment of specified milestones and Key Milestones. A Resource Plan shall be included, which shall document in detail the types and quantities of resources needed to prosecute all aspects of the Work; and

iii. The Monthly Progress Schedule shall include a Schedule Narrative Report describing the status of the Work, in detail. The narrative shall include a list of the changes made to the schedule, why those changes were necessary, progress made that period, plans for the forthcoming period, all potential delays and problems, their estimated effect on the Project Schedule and overall completion, and whether the Project is on, ahead of, or behind schedule. The Monthly Progress Schedule narrative shall not be considered to be notification of delays, request for Changes, or other issues.

3.3.8. Work Breakdown Structure

a. The Developer shall submit to the Department a detailed WBS along with its Baseline Schedule. The Baseline Schedule shall include a detailed, organized hierarchical division of the WBS for completing each element of the Work. The Accepted WBS shall be the basis for organizing all Work under the Project Agreement, and shall be used as a basis for the Project Schedules, and other control systems;

b. The WBS shall conform to the levels in Table 1. Table 1 represents Levels I through VI, which are the minimum levels of the WBS that all schedule information shall roll up. However, further detail shall be provided by the Developer for Levels IV, V, and VI to ensure a clear understanding of the Project Agreement. The Developer shall submit its Baseline Schedule broken down to the WBS Level VI activities. Additionally, a roll-up of activities unique to design, construction, and maintenance shall be shown at Level IV;

c. The Accepted WBS shall be the basis for organizing all Construction Work under the Project Agreement, and shall be used to structure the design, and other control systems. The Developer shall submit its Baseline Schedule specifying WBS activities and proposed Construction Work segments. The Baseline Schedule shall be submitted for Approval by the Department prior to the issuance of NTP1; and

d. A method statement shall be prepared for each of the Level III WBS elements listed in the Project Schedules for all Critical Path items in the Project Schedules, and for any feature not listed in the Project Schedules that the Developer considers a salient feature for timely

completion. The methods statement shall be completed in accordance with the CDOT Standard Specifications.

3.3.9. Draw Down Schedules

The Developer shall submit to the Department, for Information prior to NTP1, two draw down schedules showing the estimated monthly expenditures for the duration of the construction of the Project based off the Accepted Baseline Schedule. The first draw down estimate shall be based on the early finish dates in the Developer's Baseline Schedule. The second draw down estimate will be based on the late finish dates in the Developer's Baseline Schedule. Updated draw down estimates shall be provided within 10 Calendar Days after the Department Accepts a Revised Baseline Schedule submittal.

Table 1 WBS Levels

Level I:	**I-70 EAST PROJECT AGREEMENT PROGRAM**
Program Level – Department use only: The summary of all program components	
Level II:	**ACTIVITIES OF THE DEVELOPER**
• Activities of the Developer. This is the Developer's highest level	
Level III:	**CONSTRUCTION WORK COMPONENTS**
Developer Construction Work Components: • Breakdown of major components of the Construction Work: ○ Mobilization ○ Construction Work Management ○ Quality Management Plan ○ Changes/construction modification orders ○ Disadvantaged Business Enterprise/Emerging Small Business Plan ○ Workforce Development Plan ○ Strategic Communications ○ Environmental Management ○ Drainage ○ Utilities ○ Structures ○ Railroads ○ Right-of-Way ○ Aesthetics ○ Fire & life safety ○ Deck cover park plans ○ Maintenance of traffic ○ Roadway ○ ITS ○ ETC (including the timeframes provided in Section 3, Schedule 10 related to the ETC System Integrator's scope of work) ○ Warranty	

Level IV:	CONSTRUCTION WORK SUBCOMPONENTS
Developer Contract Subcomponents: • Breakdown of all major subcomponents of the Construction Work (i.e. level III WBS), at a minimum, the Developer shall include Level IV elements. • The Developer to define certain activities at this level (e.g., work areas)	
Level V:	**CONSTRUCTION WORK SUBCOMPONENTS AND WORK ACTIVITIES**
Breakdown defined by the Developer: • As-Built plans • Minor subcomponents (e.g., bridge substructures & superstructures, etc.) • The Developer to define certain activities at this level (work areas, phases, etc.) • Maintenance during construction (duration based)	
Level VI:	**WORK SUB-ACTIVITIES**
Breakdown defined by the Developer: • The Developer to define all activities at this level	

4. PROGRESS REPORTING

4.1. Progress Submittals

The Developer shall submit Progress Reports to the Department each month. Each Progress Report shall be submitted for Acceptance within 10 Working Days following prior month's end. Progress Report submittals shall be done electronically.

4.1.1. Progress Report Content

The Progress Report shall include:

a. A Cover Sheet indicating the following information:

i. Project number and title;

ii. Progress Report number (numbered consecutively starting with "1");

iii. Period covered by the Progress Report (specific calendar dates);

iv. Total percent complete to date for the Construction Work as a whole and for each Level III WBS activity; and

v. Identification of Nonconforming Work generated during the period covered by the Progress Report;

b. Additionally, each monthly Progress Report shall include the following:

i. Narrative description of Level V activity and progress for the Construction Work as a whole, including maintenance, design, and construction;

ii. Identification of actual start and completion dates;

iii. Update of progress with respect to Utilities and Railroads;

iv. Update of progress with respect to Right-of-Way;

v. Identification of whether any completion and deadlines are achieved or revised during the period;

vi. Summary of PC and IQC program efforts, including results of design reviews, Nonconforming Work generated, resolved and remaining outstanding;

vii. Identification of problems and issues that arose during the period and remaining problems and issues to be resolved;

viii. Summary of resolution of problems and issues raised in previous Monthly Progress Reports or resolved during the period;

ix. Summary of Construction Work accidents (frequency and severity) and the management of those accidents through the SMP;

x. Identification of critical Schedule issues and proposed resolution;

xi. Discussion of Schedule variations from Key Milestones that have slipped or improved;

xii. Monthly update and discussion of previous month's Strategic Communications activities, in accordance with the requirements of Schedule 14, including: stakeholder meetings, public meetings, community events, complaint tracking log, and outreach tools employed;

xiii. Monthly Environmental Compliance Work Plan (ECWP) activities report in accordance with Schedule 17;

xiv. Monthly report and tracking in relation to small business participation, workforce development and Davis-Bacon, in accordance with the requirements of Schedule 15; and

xv. Progress photographs.

c. The Progress Report format shall be Approved by the Department, and jointly established through consultation with the Developer, within 10 Working Days after NTP1. The Progress Report shall be on Developer 8.5 x 11 inch letterhead;

d. The status date of the Monthly Progress Schedule is the last Calendar Day of each month. The data date for use in calculating the Monthly Progress Schedule shall be the first Calendar Day of the following month;

e. The Developer shall make all corrections to the Monthly Progress Schedule requested by the Department and resubmit the Monthly Progress Schedule. If the Developer does not agree with the Department's comments, the Developer shall provide written notice of disagreement within five Working Days from the receipt of the comments. The items in disagreement shall be resolved in a meeting held for that purpose;

f. Certification by the Developer's Project Quality Manager. The Developer shall submit a certification signed by its Project Quality Manager certifying that:

i. All Construction Work, including that of designers, sub-contractors, suppliers and fabricators has been checked and/or inspected by the Developer's PC and IQC program staff, and that all Construction Work, except as specifically noted in the certification, conforms to the requirements of the Project Agreement;

ii. The Quality Management Plan (QMP) and all of the measures and procedures provided therein, are functioning properly and are being followed; and

iii. All safety critical work, in conformance with the Safety Management Plan (SMP) as further described in the Project Special Provisions set out in Appendix A to this Schedule 8, has been reviewed and sealed by the professional engineer of responsible charge before construction begins. Safety critical work is defined by the CDOT Revision of Section 107 – Performance of Safety Critical Work, included in Appendix A to this Schedule 8.

g. Maintenance Progress Report. The Developer shall submit to the Department the current Maintenance Progress Report simultaneously with the monthly Progress Report. The report shall include a summary, with a date, location, and narrative of all maintenance work

that the Developer completed per Schedule 11 *(Operations and Maintenance Requirements)*

4.1.2. Progress Status Meetings

A Progress Status Meeting shall be conducted each time a Monthly Progress Report is made. The meeting shall be used to verify, address and finalize the following:

a. Actual start dates;

b. Actual and planned completion deadlines for Key Milestones;

c. Activity percent complete;

d. Incorporation of Approved Change Orders;

e. Status of outstanding Nonconforming Work;

f. Work performance;

g. Monthly Progress Schedule, including changes from previous month's Progress Schedule; and

h. Critical Path.

5. GOVERNMENTAL APPROVALS TRACKING

5.1. Governmental Approvals tracking list

5.1.1. No later than 30 Working Days after the Agreement Date, and thereafter on each anniversary of such date, Developer shall submit to the Department a list (the "Governmental Approvals List") of all Governmental Approvals and Permits that are required in respect of Work that:

a. Have been or will be applied for within the next 12-month period;

b. Have previously been obtained and are in effect; and

c. Have expired or been terminated during the prior 12-month period.

5.1.2. The Governmental Approvals List shall identify the:

a. Date on which any Governmental Approval or Permit application was made;

b. Date on which any Governmental Approval or Permit is expected to be or was obtained;

c. Date on which any Governmental Approval or Permit expired or was terminated; and

d. Anticipated date for any expiration or renewal for any Governmental Approval or Permit.

5.1.3. Without prejudice to Developer's obligations under Sections 8.4 and 19 of the Project Agreement, as soon as reasonably practicable following a request to do so, Developer shall supply free of charge to the Department a copy of any document or documents referred to in such list.

6. QUALITY MANAGEMENT

6.1. General

6.1.1. The Developer shall be responsible for implementation and maintenance of an effective quality program to manage, control, document and assure all obligations of the Developer comply with the requirements of the Project Agreement. The Developer shall develop and submit a comprehensive Quality Management Plan (QMP) that is consistent with and expands upon the draft Stage 1 QMP and draft Stage 2 QMP submitted in the Proposal. The QMP shall document the Developer's commitment to quality, and all quality requirements of the Project Agreement. Processes and procedures established in the QMP shall be certified under (with respect to the Construction Period) and otherwise comply with (with respect to the Operating Period) International Organization for Standardization (ISO) 9001:2015, or equivalent ISO standard in effect on the date the QMP is submitted. The QMP shall encompass all Work performed by the Developer and Subcontractors of all tiers. The Developer shall obtain the Department's Approval

of the QMP in two stages: Stage 1, Approval of all non-construction related procedures and plans; and Stage 2, Approval of all construction-related procedures and plans.

6.1.2. The QMP shall delineate how the Developer will ensure that all disciplines, aspects, and elements of the Work shall comply with the requirements of the Project Agreement.

6.1.3. The QMP shall cover temporary and permanent components of the Work.

6.1.4. The QMP shall include procedures and methods that define how the Developer will collaborate with the Department through the Department's quality assurance oversight program as described in Section 6.6 of this Schedule 8.

6.1.5. The QMP shall describe the Developer's quality policy, approach to Process Control (PC) and Independent Quality Control (IQC) relative to design, construction, and Work management, quality improvement, quality personnel, and training in the QMP. The QMP shall list procedures for meeting all requirements of the Project Agreement. The Developer shall submit the Stage 1 QMP for non-construction related Work to the Department for Approval prior to issuance of NTP1. The QMP for all remaining Work (Stage 2) on the Project must have the Department's Approval prior to the issuance of NTP2. Any subsequent addenda to the QMP, required during execution of the Work, shall require the Department's Approval prior to implementation.

6.1.6. The QMP may include a process to allow the commencement by the Developer of Restricted Activities (as defined in Schedule 9, (*Submittals*)) on an at risk basis. If included, such process shall require the Developer to document at a minimum the following:

a. Identification of the need to perform the Work constituted by the relevant Restricted Activities on an at risk basis;

b. Description of such Work, including discussions with the Department;

c. Description of Developer assessment of risk associated with proceeding with such Work on an at risk basis;

d. Developer approval mechanism, above the Principal Subcontractor level, and including the IQCM;

e. Clear delineation of at risk construction plans, how and when they will be released; and

f. Verification process of acceptability of such Work once plans have formally been Released for Construction.

6.1.7. The Developer shall update and submit to the Department for Approval its QMP when its own quality management organization detects systemic or fundamental breaches of the Project Agreement or deficiencies in the manner the Work is inspected or tested, including breaches or deficiencies that have caused or that may cause Nonconforming Work to be performed, or when the Department advises the Developer of such a problem. The Developer shall also revise the QMP should any of the following conditions exist:

a. QMP or procedure within the QMP no longer adequately addresses the matters it was originally intended to address;

b. QMP or procedure within the QMP does not conform with the Project Agreement;

c. An audit by the Developer or the Department identifies a deficiency in the QMP requiring an update;

d. Organizational structure changes require revision to the QMP;

e. The Developer is undertaking, or about to undertake, activities that are not covered within the current QMP; or

f. The Department requires the QMP to be updated at its request.

6.2. Administrative Requirements

6.2.1. Quality Systems Procedures shall adhere to the following requirements:

a. Be consistent with the requirements of this Section 6.2.1 of this Schedule 8 and Developer's stated quality policy.

b. Include all Work methods and the enforcement and implementation of these work methods through best practice. However, it is inevitable that situations will arise that require a departure from the norm. These conditions shall be anticipated in the procedures and shall allow for control of these activities.

c. Define the liaison and interface between the quality organization and the design and construction arms of the Developer.

d. The quality procedures shall, as a primary objective, be written with the intent of gaining employee understanding of the system.

e. Describe the rationale for the procedures selected and, if the procedures do not address every provision of this Section 6.2.1 of Schedule 8, to explain why the standard is not applicable in their particular situation.

f. The following list of procedures (items i through xxi) shall serve as the starting point for defining Developer's quality management system:

i. Procedure for the preparation, control, and distribution of the Quality Management Plan;

ii. Scope;

iii. Key Personnel;

iv. Organizational/technical interfaces;

v. Design input requirements;

vi. Design output requirements (deliverables);

vii. Design Reviews;

viii. Department participation;

ix. Levels of responsibility and authority;

x. Procedure to control, verify, and validate the design;

xi. Procedure for document issue, approval, and revision;

xii. Procedure for the identification of, and where required by Project Agreement the traceability of, deliverable items, such as Release for Construction Documents and As-Builts;

xiii. Procedure for the verification and control of computer programs used in design;

xiv. Procedures for inspecting, testing, and calibrating equipment;

xv. Procedures for handling Nonconforming Work;

xvi. Procedures for environmental compliance;

xvii. Procedures for corrective/preventive actions;

xviii. Procedures for handling storing, packaging, tracking and submitting Deliverables;

xix. Training processes;

xx. Procedures for internal quality audits; and

xxi. Procedure for management review.

g. The implementation of the quality system shall be demonstrated by internal quality audit reports, the trending of nonconformance, records of root-cause analysis, records of corrective and preventive actions, and records of Department audits and observations.

h. Documented procedures may make reference to specifications that define how an activity is performed. Procedures shall describe the process steps of what needs to be done and work instructions shall prescribe how it is to be done.

6.2.2. Quality Policy

a. The Developer shall develop a written policy for quality, including objectives for, and its commitment to, quality. The Developer's executive management shall ensure that this policy is implemented at all levels of the Developer's organization.

b. The Developer shall publish and post a statement of its commitment to quality and the organization's quality objectives in several locations throughout the Project office and the Site. The statement shall explain the Developer's commitment to quality and the responsibility the Developer has for assuring that it meets the quality requirements included in this Schedule 8.

c. The quality policy statement shall be made known to and understood by all Developer employees, sub-consultants, Subcontractors, and Suppliers. The Developer shall conduct and document a formal training program for all Developer employees, sub-consultants, Subcontractors, and Suppliers on the quality policy prior to their participation in activities monitored by the Developer under the QMP.

d. The QMP shall include the Developer's executive management's quality policy. The QMP shall delineate the procedure used by the Developer's executive management to implement the Developer's quality policy.

6.2.3. Quality Planning

a. The Developer shall provide evidence of quality planning that ensures specific requirements of the Project Agreement have been identified and incorporated into the documented quality system. Department's requirements represent the minimum requirements.

b. The Developer shall perform IQC inspections during all phases of the Work from NTP1 until Final Acceptance to assure that the Work meets, and is being performed in accordance with, the Project Agreement.

c. The Developer shall include in the QMP its planning methods to meet the requirements of the Project Agreement. The Developer shall include, at a minimum, the activities below in its quality planning efforts to meet the Project Agreement requirements for the Work:

i. Define and develop quality objectives for the Work;

ii. Identify the necessary processes, resources, and IQC personnel that are needed to assure that Developer obligations meet the requirements of the Project Agreement, including, but not limited to, design, construction, Environmental Compliance, Strategic Communications requirements, maintenance of traffic requirements, safety, Disadvantaged Business Enterprise (DBE), Emerging Small Business (ESB), Workforce Development, training, project management processes, and the QMP;

iii. Ensure the compatibility of design, construction, installation, public information, inspection, and testing procedures;

iv. Develop and maintain up to date procedures for PC, IQC, and quality improvement;

v. Identify and define all measurable Project Agreement requirements;

vi. Identify quality hold points for Developer IQC testing and inspection and to allow the Department the opportunity to perform its owner verification responsibilities;

vii. Identify, define, and implement standards of workmanship for all applicable work features (e.g., concrete finishing);

viii. Identify, define, prepare, and maintain quality records and quality plans for all elements of design, including, but not limited to, wet and dry utilities, architectural, civil, structural, geotechnical, survey, hydraulic, environmental, traffic, safety, Right-of-Way (ROW), Railroad Work, ITS Work, and temporary Work;

ix. Develop a procedure for preparation, control, Approval, and distribution of the QMP;

x. Develop a procedure for IQC auditing to ensure the Developer, Subcontractors, and Suppliers of material understand and are effectively implementing the QMP;

xi. Develop a procedure for corrective and preventative actions regarding quality compliance and implement the quality improvement plan to address corrective Work;

xii. Develop a procedure and ensure the Developer's executive management reviews the QMP at planned intervals to ensure its continued suitability, adequacy and effectiveness. Such reviews should include PC/IQC results, owner verification results, status of corrective/preventive actions, follow-up items from previous management reviews, changes to the QMP, and recommendations for improvement; and

xiii. A systemic process for ensuring quality regardless of production or scheduling needs.

6.2.4. Process Control

a. The Developer shall be responsible for establishing, documenting, and implementing, a PC program. The PC program shall be described in the QMP and shall include all procedures necessary for the Developer to control the quality of its production processes to meet the requirements of the Project Agreement. The Developer shall develop a testing and inspection schedule to control production processes. The Developer shall conduct examinations of the quality of workmanship to confirm that all Work is being performed in accordance with all Project Agreement requirements. Appropriate follow-up inspections, sampling, and testing of materials shall be performed as each item of Work progresses to assure consistency in workmanship, compliance with Project Agreement requirements, (including design and construction documents), and satisfactory performance of the Work in service.

b. Construction PC materials testing activities shall utilize statistical analyses of material test results, including mean, variance, range, and running averages; measurements; clearances; and interactions between PC and IQC. The results of these activities shall be used by the Developer to set up control charts to monitor and track variations in materials over time. The control charts and the analytical results on which they are based shall be provided to the Department within 24 hours when requested.

c. Tests or inspections performed by production or PC personnel as part of the PC process shall not be used to satisfy the IQC requirements.

6.2.5. Control of Inspection, Measuring, and Test Equipment

a. Developer shall establish and maintain documented procedures to control, calibrate, and maintain inspection, measuring, and test equipment – including test software – used by Developer to demonstrate the conformance of product to the specified requirements. Inspection, measuring, and test equipment shall be used in a manner that ensures that the

measurement uncertainty is known and is consistent with the required measurement capability.

b. Developer shall ensure Quality Control is being performed by a group completely independent of the Developer's Project Manager and Construction Contractor. The Independent Quality Control firm or function group (IQCF) shall be an independent group employed by the Developer responsible for administering and managing the construction IQC Inspection, sampling, and Testing. The IQCF and any Subcontractors or sub-consultants thereto must not have any responsibilities for Construction Work scheduling or production activities.

c. The Developer shall establish, document and implement an IQC program. The Developer shall include in the QMP the methods and procedures by which the Work will be certified by the Developer as complying with the requirements of the Project Agreement.

d. The IQC program shall be separate from the Developer's PC program.

e. At a minimum, the IQCF testing shall include the observations, measurements, and documentation specified in the CDOT *Field Materials Manual* and its Frequency Guide Schedule for minimum materials sampling, testing, and inspection for all quality acceptance tests required. Items identified as pre-tested or pre-inspected by the Department shall remain the responsibility of Developer. The IQCF shall document the results and show if the test passed or failed based on the "pass/fail criteria" established in the Project Agreement. The IQCF shall include failing tests results in the test documentation.

f. IQC personnel shall not participate in any PC activities and shall be independent of the PC personnel.

g. The Developer shall identify in the QMP all necessary resources and personnel to perform all IQC activities required to ensure all Work meets the requirements of the Project Agreement. The QMP shall identify the construction quality hold points for IQC testing and inspection and shall describe how the Developer will notify the Department so that it may have the opportunity to perform its owner verification responsibilities.

6.2.6. Quality Improvement

a. The Developer shall establish, document, and implement a program for quality improvement. The Developer shall include in the QMP the methods for identifying, analyzing, evaluating, and implementing solutions to continuously improve quality. The QMP shall establish and maintain specific procedures to ensure a successful Quality Improvement Program.

b. The Developer shall schedule and perform internal quality audits on the basis of the status and importance of the activity to be audited. The Developer shall conduct weekly quality meetings with affected Developer staff including construction specialty leads, and the Department to discuss open Nonconformance Notices (NCN)s/Nonconformance Reports (NCR)s and quality issues. All unresolved quality issues, including but not limited to NCRs and owner verification NCNs, shall be discussed at these meetings, until resolved. The Developer shall submit an updated Nonconforming Work log to the Department weekly and shall use the log to look for Nonconforming Work trends to determine if Corrective Actions are needed.

c. The Developer shall ensure timely implementation of the necessary Corrective Actions to improve any nonconformance found during audits. The Developer's follow-up activities shall ensure the implementation and effectiveness of the Corrective Action taken. Corrective Actions shall identify the root causes of deficiencies and shall be developed, implemented, and tracked to prevent the recurrence of future nonconformance. Corrective Actions shall be monitored through review of documents, surveillance, or follow-up audits. The Developer shall keep records of Corrective Actions together with the respective audit records and submit those records to the Department upon request.

d. The Developer shall consider the Department's verification audits and the overall project goals to determine where Developer quality improvement audits shall be performed and potential Corrective Actions to be implemented.

6.2.7. Quality Personnel

a. The Developer's executive management shall have overall responsibility for success of the QMP. The Developer's executive management shall have the responsibility to ensure that personnel performing PC and IQC activities have the appropriate education, training, skills, and experience to meet the requirements of the Project Agreement. The Developer shall designate a Project Quality Manager (PQM) who shall not report to Developer's Project Manager, but shall be directly responsible to and report to the Developer's executive management. The PQM shall provide all final checks, approvals, and certifications for quality. The PQM shall be responsible for assuring, certifying, and providing documented evidence that the Work meets the requirements of the Project Agreement. The PQM shall have the authority and responsibility for the success of the Developer's quality program, and shall ensure that authority and responsibilities are defined and communicated within the organization.

b. The PQM shall be the primary point of contact to the Department for all issues relating to Developer's Quality Management Plan, including preparation, review, implementation, and updates. The PQM, irrespective of other responsibilities, shall have defined authority and responsibility for the following:

i. Ensuring that a quality system is established, implemented, and maintained;

ii. Reporting quarterly on the performance of the quality system to Developer's executive management and the Department for review and as a basis for improvement of the quality system; and

iii. Direct supervision of the IDQM and IQCM and their respective staffs.

c. The Developer shall assign an Independent Design Quality Manager (IDQM) that reports directly to the PQM and shall be responsible for all design quality control activities for the Work. The Developer shall identify a Design Process Control Manager (DPCM) for all design activities. The DPCM may be employed by the Lead Engineer and shall be responsible for all design PC activities. The IDQM shall not be involved with Construction Work scheduling or production activities, and shall report directly to the PQM. The IDQM shall ensure that the methods and procedures contained in the Approved QMP, related to design, are implemented and followed by the Developer, subcontractors, fabricators, suppliers, and vendors in the performance of the Work.

d. The Developer shall assign an on-site Construction PC Manager (CPCM) who shall be responsible for management of the PC aspect of the QMP. The CPCM shall not be involved with Construction Work scheduling or production activities, and shall report directly to the Developer's management team. The CPCM shall ensure that the methods and procedures contained in the Approved QMP, related to construction, are implemented and followed by the Developer, subcontractors, fabricators, suppliers, and vendors both on-site and off-site in the performance of the Work.

e. The Developer shall assign an on-Site Independent Quality Control Manager (IQCM) who shall be a member of the IQCF and independent of Construction Work scheduling or production and shall be responsible for management of the IQC aspect of the QMP. The IQCM shall report to the PQM and to the Department. The IQCM shall not report to any person or party directly responsible for design or construction production.

f. The IQCM and CPCM shall both have or obtain the American Society for Quality (ASQ) certification as Quality Inspector, Quality Engineer, or Manager of Quality as an NTP2 Condition.

g. The Developer's PQM, IQCM, IDQM, CPCM, and DPCM shall review and approve the QMP prior to submittal to the Department. The Developer shall assure, certify and provide documented evidence that the Work meets the requirements of the Project Agreement. At a minimum, the PQM shall report the status of the Work's quality monthly to the Department.

h. All construction IQC testing personnel and PC testing personnel performing concrete and hot bituminous pavement process control tests shall meet the standards established in Section CP-10 of the CDOT *Field Materials Manual*.

i. All construction IQC inspection personnel performing fabrication inspection of structural steel elements shall be qualified in accordance with Section 4.0 of the *CDOT Staff Bridge Fabrication Inspection Manual, Fabrication Inspection of Structural Steel Items for CDOT Roads and Bridge.*

j. All construction IQC testing and inspection personnel performing inspections and tests for pre-stressed and precast concrete products shall be qualified in accordance with Section 3.0 of the *CDOT Staff Bridge Fabrication Inspection Manual, Fabrication Inspection of Pre-stressed and Precast Concrete Products.*

k. The Developer shall ensure that personnel performing Work shall have the education, training, skills, and experience to meet the requirements of the Project Agreement. The Developer shall maintain appropriate personnel records that may be examined by the Department upon request.

6.2.8. Training

a. The Developer shall establish and maintain documented procedures for identifying training needs and requirements and shall provide training of all personnel performing activities affecting quality. Personnel performing specific assigned tasks affecting quality shall be trained in the specific plans, processes, and procedures as assigned in the QMP (e.g., Materials Testing and Inspection Plan (MTIP), Developer auditing procedures, etc.).

b. The Developer shall provide training to all personnel that may interface with the Department's oversight efforts (audit process) to ensure they understand their roles and responsibilities for cooperating and responding to audits.

6.3. Quality Management Plan Requirements

6.3.1. The QMP shall state the Developer's commitment to quality and provide a clear definition of the scope of activities and detail the methods to ensure the Work meets the requirements of the Project Agreement. The QMP shall list all deliverables to the Department, as required by the Project Agreement and this Section.

6.3.2. Responsibility and Authority

a. The Developer shall include in the QMP an organizational chart that illustrates a commitment to an effective quality program to ensure all Work meets the requirements of the Project Agreement. The QMP shall describe the hierarchy of the Developer's organization. The QMP shall graphically depict the principal quality participants, showing lines of responsibility, authority, communication, and interfaces with the Department; other involved agencies; and any other team members having a significant quality role, including subconsultants, Subcontractors, and Suppliers. The PQM, IDQM, DPCM, CPCM (and PC staff) and IQCM (and IQC staff) shall be shown on the organization chart to report to the Developer's executive management and be independent of the Developer's Project Manager. The Developer shall update the organization charts and distribute those charts to the Department when any changes to the organization are made.

b. The QMP shall describe the roles and responsibilities of the PQM, IDQM, DPCM, CPCM, IQCM, PC and IQC staff, and other key personnel; and shall describe their authority to implement quality improvements for the Work.

c. The Developer's IQC managers and IQC staff shall have no responsibilities in the management and production of the Construction Work and IQC personnel shall have the authority to stop Work that does not comply with requirements of the Project Agreement.

d. The responsibilities of all personnel who manage, perform, and ensure the quality of the Work include:

   i. Initiate action to prevent the occurrence of Nonconforming Work;

   ii. Identify, evaluate, and document quality problems;

   iii. Recommend or initiate quality improvement solutions through established organizational channels;

   iv. Ensure the implementation of quality improvement solutions; and

   v. When Nonconforming Work is identified, stop all Work that is affected by the Nonconforming Work until the deficiency is corrected.

e. The PQM, IDQM, DPCM, CPCM, and IQCM shall have the following responsibilities defined in the QMP:

   i. Facilitate compliance of Work with the requirements of the Project Agreement and the Approved QMP;

   ii. Approve Developer quality processes and procedures;

   iii. Provide adequate resources and trained personnel for PC and IQC activities;

   iv. Ensure the adequacy and enforcement of quality procedures, processes, inspections, and tests for all Work;

   v. Establish and implement procedures to control and ensure the Work performed by subconsultants, Subcontractors and Suppliers meet the requirements of the Project Agreement;

   vi. Ensure the QMP is being implemented and report in writing regularly to the Developer's executive management regarding the status of the implementation of the QMP;

   vii. Ensure that quality records are properly prepared, completed, maintained, and delivered to the Department, as required by the Project Agreement, to provide evidence of PC and IQC activities performed and quality results achieved;

   viii. Ensure that IQC staff is independent of the Developer's Project Manager and regularly reports to the Developer's executive management; and

   ix. Continually promote awareness of the requirements of the Project Agreement throughout the Developer's entire project organization.

6.4. Independent Quality Control

6.4.1. General

a. The Developer shall establish, document, and implement an IQC program. The Developer shall include in the QMP the methods and procedures by which the Work shall be certified by the Developer as complying with the requirements of the Project Agreement.

b. The QMP shall establish procedures for procuring services. The procedures shall include a review and approval process by the Developer for adequacy of specified technical requirements and the adherence to quality requirements.

c. The QMP shall describe the measures to be taken to ensure that Subcontractors, Suppliers and subconsultants meet, implement, document, and maintain the QMP requirements.

d. The selection of Subcontractors, Suppliers and subconsultants and the type and extent of control exercised by the Developer shall be dependent upon the type of product or service and, where appropriate, on records of Subcontractors', Suppliers' and subconsultants' previously demonstrated capability and performance.

6.4.2. Design Quality Control

a. The QMP shall include procedures that address all elements of design, including, but not limited to, wet and dry utilities, architectural, civil, structural, geotechnical, survey, hydraulic, landscaping, aesthetics, environmental, traffic, safety, ROW, and temporary Work. The Developer shall identify in the QMP all applicable computer programs to develop and check designs.

b. The QMP shall describe how the design team plans and schedules the design efforts, including task force meetings, design reviews, constructability reviews, design meetings, independent design checks, and discuss how these activities are accounted for in the overall Project Schedule.

c. The Developer shall identify in the QMP design input requirements. The Developer shall perform ongoing audits of the design input requirements. The Developer shall maintain an accessible, centrally controlled design manual, database, or list that contains all relevant design inputs to be used by design personnel for the Work. The Developer shall provide a process in the QMP to ensure that the design inputs are communicated to, and accessible by, the relevant designers responsible for incorporating design inputs into the design. The Developer shall include in the QMP how changes to design inputs are identified, reviewed, and approved by authorized personnel prior to their implementation. The QMP shall also include:

i. Procedures to control and independently ensure that the design meets the requirements of the Project Agreement, including provisions for subconsultant's designs and configuration management activities;

ii. Procedures to identify and track design document deliverables;

iii. Procedures for Developer approval, tracking and recording revisions to Release for Construction (RFC) Documents. The Developer shall have a formal procedure for comment resolution included in the QMP;

iv. Procedures for Developer approval of RFC Documents; and

v. Procedures for approval of supplier-provided design drawings (e.g. shop drawings), including opportunity for the Department to perform audits.

d. The Developer's design quality program shall include processes based on Developer's obligations under this Section 6.4.2.d.

i. The Developer shall prepare, and submit to the Department for Acceptance, preliminary (30% level) plan packages which (1) show how the Developer's design meets the Schedule 10 *(Design and Construction Requirements)* obligations and Ultimate configuration accommodation requirements and (2) include:

A. Cover sheet;

B. Typical sections;

C. Plan and profile for the I-70 Mainline, CDOT Roadways, and Local Agency Roadways;

D. Structure Concept Plans including:

(I) Plans, elevations, and appropriate typical sections for each bridge type;

(II) Plan views of the structure identifying each bridge location and type. Include documentation of design vehicle turning movement analysis;

(III) Plan views of the structure identifying each wall location and type;

(IV) Description of conceptual solutions for complex structural problems identified by the Developer;

(V) Description of creative or innovative ways the design, construction, and/or choice of structural types will benefit and/or enhance the Project Schedule, quality, aspects of the structure; and minimize traffic impacts; and

(VI) Structure numbers for major structures.

E. Drainage structure general layouts;

F. Master drainage plan (including Groundwater Elevation Plans);

G. Master Drainage Report;

H. Master Water Quality Report;

I. Preliminary wall layouts; and

J. Roadway cross sections at 50 foot intervals.

ii. Task Force Meetings

The Developer shall conduct weekly task force meetings to coordinate the design development within the Developer's organizations and with the Department and other affected agencies. As a minimum, the Developer shall prepare an agenda and conduct each meeting to discuss the status of the design, coordinate the design development between design disciplines, discuss constructability issues, and identify any questions associated with design requirements. The Developer shall take meeting minutes for all task force meetings and provide minutes to the Department for Acceptance within four Working Days after each meeting. The Developer shall provide final minutes to the Department via the Department's document management system on a monthly basis.

iii. Design Progress Review Meetings

The Developer shall hold one design progress review meeting during the design development process (e.g., 90% package) and invite the Department to attend. The design progress review meetings shall be scheduled, conducted, and documented by the Developer. The Developer shall take meeting minutes and submit those minutes to the Department for Acceptance within four Working Days after each meeting.

iv. Final (100% Level) Plan Package

The Developer shall prepare the final (100% level) plan packages showing how the Developer's design meets the Schedule 10 *(Design and Construction Requirements)* obligations and submit to the Department for Acceptance. After the review period, the Developer shall conduct a comment resolution meeting with the Department. The Developer shall take meeting minutes and submit those minutes to the Department for Acceptance within four Working Days after each meeting.

v. RFC Documents and revisions to RFC Documents

RFC Documents shall be submitted for Acceptance by the Department. The RFC Documents shall include an MTIP. This plan shall give testing quantities and frequencies, and IQC inspection quality hold points to confirm minimum QMP requirements have been met. The Developer's Project Quality Manager shall approve the RFC Documents prior to RFC. The Developer shall submit one electronic copy of the RFC Documents to the Department. The Developer's IQC process for the RFC Documents shall be thoroughly documented in the Developer's QMP.

vi. Prior to release of RFC Documents for structure construction, the following items shall be required:

A. The independent design check shall have been completed per the CDOT *Bridge Design Manual* and the original final structural design calculations shall be revised and corrected based on comments from the independent design check for the structural element to be constructed.

B. The Rating Package as defined in the CDOT *Rating Manual* shall be completed prior to release of the superstructure construction drawings.

vii. As-Built Documents

As-Built documents shall be submitted to the Department for Acceptance. The Department may audit As-Built documents to ensure completeness and compliance with the requirements of the Project Agreement. The Department shall not Accept As-Built documents until the Developer has addressed, resolved, and incorporated, to the satisfaction of the Department, any prior Developer or Department comments. The Developer shall ensure and provide documentation to the Department that all review comments have been addressed. The As-Built documents shall be bundled into packages that match the RFC design Deliverable packages. The As-Built documents submittal shall include:

A. All plans reflecting RFC Documents or revisions to RFC Documents;

B. Resolution of nonconformance;

C. Design calculations;

D. Design reports;

E. Specifications;

F. Electronic CADD files, as specified elsewhere in the Project Agreement; and

G. Index summarizing all revisions to initial RFC Documents.

viii. The Developer shall include in the QMP a process for a licensed engineer in responsible charge for the design to prepare, review, and approve all changes, including field design changes, RFC Documents, and As-Built documents. The Developer shall maintain a master list of approved design changes. The QMP shall include a process to communicate design changes to those completing the Work on a timely basis consistent with the progress of construction activities.

ix. Environmental review

The Developer shall include in the QMP a process for Environmental review prior to submission of final (100% level) plan packages showing how the Developer's design meets the Environmental Requirements, including the Developer's obligations under Schedule 17 *(Environmental Requirements)*.

x. ROW processes and documents

All ROW processes, exhibits, plans, appraisals and appraisal reviews, value findings, and acquisition and relocation files shall undergo a Developer prepared IQC review process to ensure compliance with the Uniform Act, Colorado State Statutes, Department procedures and the Developer's obligations under Schedule 18 *(Right-of-Way)*. In the event of an instance of nonconformance or an audit of the Developer's IQC process identifies a nonconformance with Schedule 18 requirements, the Department may elect and engage, at the expense of the Developer, a firm to conduct its own quality review. In such event, the Developer shall implement corrective and preventative actions to eliminate recurrence.

6.4.3. Construction Quality Control

a. The Developer shall perform and document all required construction PC and IQC activities necessary to control the Work. The QMP shall extend to both permanent and temporary Work (erosion control, traffic control, drainage, etc.). Records of inspection and testing activities (other than materials inspection and testing) shall be submitted to the Department through Aconex. Records of materials inspection and testing shall be submitted to the Department through the Department's Quality Records Database (QRD), a secure web-based application. The Department will provide user accounts and training for use by the Developer of the QRD. Materials test reports will also require entry of meta-data fields for analysis and comparison to the Department's verification test results.

b. As a minimum, the Developer's construction IQC Program shall include the elements defined below:

i. Certification:

The Developer shall include in the QMP a process to submit certificates to the Department at the following times that the Work performed meets the requirements of the Project Agreement (such certificates to be in the form set out in Appendix B to this Schedule 8, amended as appropriate in the case of certificates required to be submitted pursuant to Section 6.4.3.b.i.D):

A. prior to each Milestone Completion;

B. prior to Substantial Completion;

C. prior to Final Acceptance; and

D. at any other time requested by the Department (including in relation to any Renewal Work).

ii. Inspection:

The Developer shall include in the QMP, and submit to the Department for Approval, an MTIP that shall include detailed inspection procedures to be used in cases where inspections are to serve as the basis for verifying compliance with the requirements of the Project Agreement. The Developer shall submit to the Department (A) all records of inspection and testing (other than materials inspection and testing) through Aconex and (B) all records of materials inspection and testing through the Department's QRD. The Developer shall conduct each inspection in accordance with the Approved QMP. The Developer shall document whether the inspections passed or failed based on the "pass/fail criteria" established in the procedure and the requirements of the Project Agreement; (e.g., concrete depth checks on deck pours, rebar clearance/size, locations, elevations, stationing etc.). The Developer shall include failing inspection results, when applicable, in the inspection documentation.

iii. Testing:

At a minimum or unless otherwise specified in this Project Agreement, the Developer shall follow the CDOT *Field Materials Manual* and its Frequency Guide Schedule for minimum Materials sampling, testing, and inspection requirements identified under the column titled “Work Verification Sampling & Testing Frequency” for all IQC tests required. The Developer shall document the results of all testing (showing if the test passed or failed based on the "pass/fail criteria" established in the Project Agreement) and submit such results to the Department through Aconex (other than the results of materials testing, which shall be submitted through the Department’s QRD). The Developer shall include failing tests results in the test documentation. Independent Laboratories shall submit signed and certified test reports to the Developer not more than 10 Working Days after completion of the tests for all tests which require an independent Laboratory. The Department may witness any test conducted for Independent Assurance purposes. The Developer shall develop and maintain a current test log for all tests required by the Project Agreement. As a minimum, the Developer shall document results of tests in report format and include the following:

A. Project Agreement Project identification number

B. Identification of items tested

C. Quantity

D. Date and time test conducted

E. Location of items tested

F. Test procedure used

G. Name of technician

H. Acceptance criteria

I. Results - Acceptance or rejection

J. Authorized signature

iv. Certificate of Compliance, Certified Test Report and Buy America documentation:

A. The Developer shall include in the QMP a method of handling and documenting work/products accepted in the Work by Certificate of Compliance (COC) or Certified Test Report (CTR).

B. The Developer shall include in the QMP a method for documenting and tracking, on a basis consistent with Developer’s Progress Reporting, compliance with Buy America Requirements of 23 CFR 635.410, and at a minimum shall address the following obligations of the Developer:

(I) The Developer shall maintain on file certifications that every process, including the application of a coating, performed on steel or iron products either has or has not been carried out in the United States of America. This certification applies to every iron or steel product that requires pre-inspection, pretesting, certified test results, or a certificate of compliance. The Developer shall obtain such a certification from each supplier, distributor, fabricator, and manufacturer that has handled each steel or iron product. These certifications shall create a chain of custody trail that includes every supplier, distributor, fabricator, and manufacturer that handles the steel or iron product. The lack of these certifications shall be justification for rejection of the steel or iron product.

(II) The Developer shall maintain a document summarizing the date and quantity of all steel and iron material delivered to the Project. The document shall show the pay item, quantity of material delivered to the Project, along with the quantity of material installed by the cutoff date for the monthly Progress Report. The summary shall also reconcile the pay item quantities to the submitted Buy America certifications. The Developer shall also maintain documentation of the project delivered cost of all foreign steel or iron permanently incorporated into the Project. Such summary and the cost information shall be submitted to the IDQM within five Working Days of the cutoff date for each monthly Progress Report during (I) the Construction Period and (II) during the Operating Period for any month in which any Renewal Work is being performed that includes steel or iron products. A monthly summary shall be required even if no steel or iron products are incorporated into the Project during the month. The summary document does not relieve the Developer of providing the necessary Buy America certifications of steel and or iron prior to permanent incorporation into the Project.

C. The Developer shall obtain COCs and CTRs prior to incorporation in the Work and maintain a complete log of all COCs and CTRs. The Developer shall make the log and all COCs/CTRs available for owner verification at any time during normal business hours and shall submit the COC/CTR log for Acceptance prior to Substantial Completion.

D. The Developer shall include in its COC/CTR log signed certification that all materials represented by each COC/CTR were installed in the Work. Certification shall be in accordance with requirements of the Project Agreement.

v. Quality Reviews:

The Developer's PQM or designated representative shall document formal reviews to verify that the Approved QMP is being effectively implemented.

vi. Environmental compliance in Construction:

The Developer shall include in the QMP a Section detailing the IQC activities that will be performed to ensure compliance during construction of all environmental requirements. IQC staff oversight of all Schedule 17 *(Environmental Requirements)* elements that apply to construction is required. These elements include but are not limited to: construction air quality, construction noise, noxious weed management, landscape planting and establishment, water quality, protection of wetlands and other sensitive areas, hazardous materials and environmental hardscape elements such as noise walls.

6.4.4. Materials Testing and Inspection Plan

a. The Developer shall prepare and implement a MTIP as part of the QMP that includes the appropriate criteria, tests, and inspection requirements identified in CDOT's *Standard Specifications*, *Field Materials Manual, CDOT Staff Bridge Fabrication Inspection Manual*; Developer-prepared inspection checklists; and requirements as set forth herein.

b. The MTIP shall describe all of the proposed inspections and tests procedures, including products provided by suppliers during the manufacturing, receiving, and installation process, to ensure the requirements of the Project Agreement are met. The MTIP shall identify all inspections and tests required and include, at a minimum, reference to the requirements of the Project Agreement, frequency of the inspections and tests, and the Developer-prepared IQC processes. Where no inspections or test standard exists in any of

CDOT's manuals, the Developer shall develop criteria, in writing, based upon the best-available industry standard information and technology.

c. The MTIP shall include procedures for delivery, handling, and storage of furnished products ensuring that they are properly handled and stored to prevent damage, deterioration, or theft. It shall also document procedures for stored items and materials consistent with the expected duration and type of storage, and procedures for monitoring special processes utilized in fabrication, assembly, and testing of specified products. Special processes are those requiring qualified/certified production, inspection, and test personnel to perform highly skilled work, such as welding, brazing, soldering, non-destructive testing, machining, coating, or plating.

d. The MTIP shall describe all IQC inspection and test activities to be carried out including quality hold points, and establish authority within the Developer's organization for releasing Work beyond the quality hold point. While the Developer shall notify the Department when Work has progressed to a quality hold point, it shall be the responsibility of the Developer's Quality Managers to verify that all requirements have been met prior to allowing the Work to progress.

e. The MTIP shall include a summary of activity-specific material quantities to document that the minimum sampling, testing, and inspection requirements have been met. This summary shall be performed and provided to the Department for Acceptance monthly. The Developer may follow the CDOT Form 250 as a minimum basis for their materials documentation record.

f. The MTIP shall include processes to control, calibrate, and maintain test equipment to ensure it meets industry standards and other applicable requirements. Test equipment used by the Developer shall be of a quality and capacity that ensures that measurements made are to levels of accuracy and precision that are required by the test procedure. The MTIP shall:

   i. Identify the test required and the accuracy required, and select the appropriate test equipment;

   ii. Define procedures to calibrate all test equipment prior to initial use and at prescribed maintenance intervals against certified equipment and measurement standards of the National Institute of Standards and Technology or other similar recognized technical standards customarily accepted in the industry. Where no standard exists, the basis for calibration shall be developed in writing based upon the best-available information and technology;

   iii. Identify test equipment with a suitable indicator to show the calibration status of the test equipment;

   iv. Maintain current calibration records for test equipment;

   v. Define procedures to ensure that environmental conditions are suitable for calibrating test equipment;

   vi. Define procedures to ensure that the handling and storage of test equipment is such that the accuracy and fitness for use is maintained;

   vii. Define procedures to safeguard test equipment, including test hardware and test software, from adjustments that would invalidate calibration settings; and

   viii. Identify procedures with respect to the paving for the Project that includes the following:

      A. A thorough definition of pavement smoothness and quality, which shall be the same for all travel lanes and shoulders, and the identification of steps for maintaining these criteria, including defined hold points and potential corrective measures;

B. Detailed information on identification of potential issues affecting quality such as smoothness, dumping and batching;

C. Procedures for monitoring, minimizing and correcting for lane to lane roughness variation;

D. Procedures for the control of segregation in HMA paving, and process to address unacceptable segregation that includes, at a minimum, a stop work provision and root cause analysis prior to restart;

E. Procedures for dowel bar placement and Magnetic Imaging Tools (MIT) testing and auditing, including the Developer's obligation to provide additional test sections for MIT testing and auditing at the Department's discretion; and

F. A Portland cement concrete pavement (PCCP) plan for addressing noted issues with performance and procedures to correct such issues.

6.4.5. Quality Hold Points

a. Developer shall establish Quality Hold Points (QHPs) at stages of the construction progress to ensure Work is performed in accordance with Developer's Quality Management Plan and within the terms and conditions of the Project Agreement. Prior to reaching the first instance of any QHP, the Developer's PQM, IQCM and IDQM shall meet to review documentation and procedures for PC/IQC, including but not limited to material certifications, daily inspection records, material testing results, survey results, permits, and material placement records. The Developer shall invite the Department to each of these meetings. Developer's PQM shall coordinate group members to ensure that QHP checks are accomplished in a timely manner so that Developer is not delayed. When an identified QHP is reached, the PQM shall notify both IQC and the Department. IQC shall be solely responsible for verifying and documenting whether Work has been completed for the QHP. Notification that a QHP has been reached while Work is still being performed or not allowing adequate time to complete the QHP review and opportunity for adjustments (e.g., concrete trucks are queuing while reinforcement is still being placed and QHP is being reviewed for a specified unit) shall result in the issuance of a Nonconformance Report.

At a minimum, Developer shall establish QHPs at the following stages of construction:

i. Environmental:

A. After the establishment of Water Quality BMPs, and prior to initial ground disturbance;

B. Upon completion of surveys for nesting birds and protected species, prior to ground disturbance, in accordance with Project Special Provision 240, Schedule 17 *(Environmental Requirements)*;

C. Upon completion of protection of environmental resources, in accordance with Schedule 17 *(Environmental Requirements)*, where fencing or other appropriate protection mechanism is required, prior to ground disturbance; and

D. At the end of each month to review Developer's weekly and post-storm inspections.

ii. Embankments:

A. After the completion of drainage and Utility Relocations and prior to backfill;

B. After clearing, grubbing, and excavation to check subgrade;

C. Per specifications for lift requirements at 5 foot intervals of embankment construction;

D. After the completion of mechanically stabilized earth (MSE) wall panel placement; and

E. At the completion of embankment placement.

iii. Structures:

A. At the completion of placement for bridge deck reinforcement and prior to the placement of concrete;

B. At the completion of placement for abutment wall reinforcement and prior to the placement of concrete;

C. After the completion of pile-driving at each structure support, including pile-driving results and records;

D. At the completion of placement for footing reinforcement steel and prior to the placement of concrete;

E. At the completion of excavation for drilled shaft foundations and prior to concrete placement;

F. After setting rails for screed machine and prior to placing concrete overlays;

G. After the completion of the first component to receive specified aesthetic wall treatment/form liner and prior to proceeding with the construction of subsequent components; and

H. After the completion of every 500 feet of noise wall posts and panels.

iv. Utilities:

A. After the installation of direct-burial duct banks and prior to backfill operations;

B. For concrete-encased duct banks, after the installation of conduits and prior to the placement of concrete; and

C. For all Utility lines intended to transport pressurized materials and lines intended to carry liquids, after the installation and prior to the completion of pressure testing.

v. Paving and sidewalks:

A. Before the placement of each course above subgrade on permanent roadway components;

B. Before the placement of each lift of asphalt or Portland cement concrete; and

C. Prior to the placement of concrete for sidewalks.

vi. ITS and Tolling:

A. After the completion of the requirements identified in each of Schedule 10, Sections 3.5.7, 3.5.8 and 3.5.9 and prior to the ETC System Integrator's work;

B. After completion of staking for ITS and tolling locations and prior to installation, per Schedule 10, Section 3.8.8.a.i;

C. After installation of manhole, pull box, or conduit and prior to backfilling;

D. After installation of sign structures, pole and mounting brackets; and prior to installation of ITS devices; and

E. After fiber installation and prior to fiber splicing or cutover, per Schedule 10, Section 3.8.8.b.iii and 3.8.26.a.

6.4.6. Reporting and Record-Keeping of Quality Documentation

a. The Developer shall maintain construction workmanship and materials quality records of all inspections and tests performed per the QMP. These records shall include factual evidence that the required inspections or tests have been performed, including type and number of inspections or tests involved; results of inspections or tests; nature of Nonconforming Work and causes for rejection, etc.; proposed remedial action; and Corrective Actions taken. These records shall cover both conforming and Nonconforming Work, and shall include a statement that all supplies and materials incorporated in the Work are in full compliance with the Project Agreement.

b. The Developer's Quality Managers shall ensure that quality records are properly prepared, completed, maintained, and delivered to the Department, as required by the Project Agreement, to provide evidence of the quality activities performed and quality results achieved.

c. The Developer shall submit all IQC test measurements and test results, including failing results, and inspection records. The Developer shall submit test data and approved test results to the Department for Information using Aconex (or, in the case of data and results related to materials testing, through the Department's QRD) within 24 hours following the inspection or test completion. The responsible technician and the technician's supervisor shall sign the daily test reports.

d. The Developer's Quality Managers shall also maintain a daily log of all inspections performed for both Developer and sub-contractor operations. The daily inspection reports shall identify inspections conducted, dates of inspections, results of inspections, locations and nature of defects found, causes for rejection, and remedial or corrective actions taken or proposed. The responsible technician and the technician's supervisor shall sign the daily inspection reports. These daily inspection reports shall document the day's events, activities, and discussions in a format consistent with the requirements contained within CDOT's *Field Materials Manual* and *Construction Manual*.

e. To enhance coordination of the Department's Independent Assurance activities during construction, the Developer shall provide the Department with a weekly look ahead of specific scheduled construction activities designating location and planned quantities of materials to be placed, and protocols for identifying completed Work. The Developer shall provide the Department with the actual construction activities conducted during the previous week, designating location and quantities of materials that were placed.

6.5. Nonconforming Work

6.5.1. The QMP shall include procedures to develop and maintain a system to identify, control, remedy and report Nonconforming Work, including Nonconforming Work identified through the issuance of a NCN by the Department. The Developer shall remedy Nonconforming Work in accordance with the Approved QMP. The responsibility for review and authority for the disposition of Nonconforming Work shall be defined in the QMP. The Developer shall document the identification of Nonconforming Work by completing and submitting a NCR to the Department as soon as reasonably practicable, and in any event within 24 hours, after the Developer first becomes aware of the Nonconforming Work. Each NCR shall include:

a. Identification of Nonconforming Work, including tagging work products;

b. Evaluation of the Nonconforming Work, including the cause thereof;

c. Recommendation for "reject" or "remedy" disposition (including, in the case of a "remedy" disposition, details of the recommended Nonconforming Work Remedy);

d. Schedule for completion of any applicable Nonconforming Work Remedy, including, if the Developer considers that Appendix A-1 or Appendix A-2 to Schedule 11 Operations and

Maintenance Requirements applies to any Nonconforming Work that is O&M Work, the remedy period for completion of such Nonconforming Work Remedy that applies pursuant to such Appendix;

e. Signature lines for the Department's Approval of (i) the disposition and (ii) in the case of a "remedy" disposition, the recommended Nonconforming Work Remedy, including the Schedule for completion thereof. The Developer shall not commence with any Nonconforming Work Remedy or progress beyond Nonconforming Work until the Department has provided its Approval;

f. If applicable:

i. a Corrective Action Plan detailing the proposed Corrective Action in relation to such Nonconforming Work and to prevent recurrence;

ii. responsibility for accomplishing Corrective Action through a Corrective Action Plan;

iii. Schedule for completion of Corrective Action;

g. Signature line for the Department's Approval of any applicable Corrective Action Plan;

h. Signature lines for the design or construction IQC Manager verifying that any applicable Nonconforming Work Remedy has been completed;

i. Signature lines for the design or construction IQC Manager verifying that any applicable Corrective Action has been completed in accordance with the Corrective Action Plan;

provided that:

A. the initial NCR submitted to the Department pursuant to this Section 6.5.1 in respect of any Nonconforming Work shall only be required to include the information required by Section 6.5.1.a and, if known at the time of submission of the NCR, Section 6.5.1.b; and

B. the information required by Sections 6.5.1.b (if not included in such initial NCR) and c through i shall only be required to be included in the updated NCR submitted to the Department pursuant to Section 6.5.2 of this Schedule 8.

6.5.2. Within five Working Days after the issuance by the Developer of any initial NCR pursuant to Section 6.5.1 of this Schedule 8, the Developer shall submit an updated NCR to the Department for Approval that recommends, as appropriate, a "reject" or "remedy" disposition for the Nonconforming Work and, in the case of a recommended "remedy" disposition, should identify the Nonconforming Work Remedy it proposes, together with the other information required to be included in such updated NCR in accordance with proviso B to Section 6.5.1 of this Schedule 8.

6.5.3. Prior to the submittal of any updated NCR to the Department, the Developer's Project Manager shall approve (a) the recommended disposition specified in such NCR and (b) in the case of a "remedy" disposition, the recommended Nonconforming Work Remedy.

6.5.4. The Developer's Project Quality Manager shall document the completion of any Nonconforming Work Remedy and, if applicable, any Corrective Action, once accomplished, and promptly notify the Department so that the Department can perform its verification.

6.5.5. The QMP shall include procedures for controlling the use of Nonconforming Work including the tagging of Nonconforming Work products. Nonconforming Work product tags shall only be removed by the originator of the NCR or the originator's supervisor, and only when the Developer demonstrates to the Department that the Nonconforming Work product meets the requirements of the Project Agreement.

6.5.6. For verification and acceptance purposes, the Department will perform assessment of the Work. These efforts do not relieve the Developer of responsibility for checking all Work. The Department will forward all assessment reports and NCNs to the Developer. NCNs may be:

a. Level 1, identifying Nonconforming Work that represents an immediate or imminent health or safety hazard, nuisance or other similar immediate or imminent risk to Users or workers or an immediate or imminent risk of structural failure, damage to a third party's property or equipment or damage to the Environment; or

b. Level 2, identifying any other category of Nonconforming Work.

6.5.7. Within 24 hours of the issuance of a Level 1 NCN and within five Working Days of issuance of a Level 2 NCN by the Department, the Developer shall respond to the Department by submitting an NCR (which shall include all information specified in Sections 6.5.1.a through i of this Schedule 8 in respect of the Nonconforming Work identified in the NCN) for Approval. The Department shall provide user accounts and training for this purpose. The Developer shall describe in the QMP its approach and methodology for resolving and responding to any NCNs issued by the Department.

6.5.8. Corrective and Preventative Action

a. The QMP shall describe corrective and preventative action ("Corrective Action") procedures that the Developer shall use to identify and improve processes and remedy issues that produce, or may produce, systemic Nonconforming Work. The Developer's Corrective Action procedures shall include:

i. Methods to investigate the cause of systemic Nonconforming Work and to determine what Corrective Action is needed to prevent recurrence;

ii. Methods to analyze all processes, Work operations, quality records, service reports, and Department assessments/testing to detect and eliminate the possibility of systemic Nonconforming Work from occurring;

iii. Methods to prioritize Corrective Action efforts based upon the level of risk to the quality of the Work;

iv. Controls to ensure that effective Corrective Action is taken when the need is identified; and

v. Methods to implement and record changes in procedures resulting from any Corrective Action.

b. If systemic Nonconforming Work is identified by the Developer or identified by the Department by the issuance of a corrective action request (CAR) notice to the Developer, the Developer shall submit a Corrective Action Plan to the Department.

6.5.9. Punch List Work

The Developer shall develop Punch Lists and Punch List logs recording information required to demonstrate the Developer's compliance with Section 5 of Part 7 of Schedule 3 Commencement and Completion Mechanics. All Punch Lists and Punch List logs shall be completed by PC and IQC personnel. The Department and other affected agencies shall be invited by the Developer to attend walks of the Work to include items on Punch Lists. The Developer shall provide all Punch Lists and Punch List logs for Approval to the Department.

6.5.10. The provisions of this Section 6.5 are without prejudice to the provisions of Schedule 6 Performance Mechanism.

6.6. Quality Assurance Oversight

6.6.1. Department Quality Oversight

a. The Department retains the responsibility for acceptance of the Work as required in Title 23, Code of Federal Regulations, Part 637.

b. The Department will periodically audit the Developer's Quality Management activities, including conducting independent verification sampling and testing to assess the Developer's compliance with the requirements of the Project Agreement. The Department

reviews of sampled Work for Project Agreement compliance are defined as verification reviews. The four types of the Department verification reviews are:

i. Design verification reviews: The Department will perform design verification reviews on the products of design (drawings, specifications, and other design deliverables) on an ongoing basis during the Work. The Developer shall submit documents for design verification reviews to the Department for Acceptance a minimum of five Working Days in advance of review meeting.

ii. Construction verification Inspections: The Department will perform construction verification inspections on construction activities.

iii. Construction verification Testing: The Department will perform sampling and Testing of materials to validate the Developer IQC testing program. Verification Test results will be stored in the QRD.

iv. Process Audits: The Department will perform process audits on the implementation of all Developer Work activities, excluding design and construction. Such activities may include the requirements of the Project Agreement, such as public information, maintenance of traffic, environmental compliance, safety, project management processes, and meeting the requirements of the Approved QMP.

c. Verification reviews will entail the collection and documentation of objective evidence to determine whether the requirements of the Project Agreement have been met. The results of the Department verification reviews will be recorded by the Department and will be documented within the Department's QRD. Any NCNs identified by the Department require a response within the QRD.

d. Department will provide the Developer access to the Department's QRD application to review and respond to observations made during Department Quality Oversight activities. Developer is required to utilize the Department's QRD application to record all material test quality records, and to respond to Department generated observations. Developer is given the option of either directly entering all PC/IQC observations and material test results into the Department's QRD application or providing Department with data collected during PC/IQC efforts in an electronic format compatible for batch upload into Department's QRD application. Department generated observations will be identified either as conforming or nonconforming to related requirements of the Project Agreement. Department observations will be presented to Developer through Department Quality Oversight Verification Reports. A construction Nonconformance Report will be closed by Department upon the verification of a resolution of the issue Approved by the Department.

6.6.2. Department Owner Verification Testing

The Department will perform periodic verification tests to ensure that the Developer's materials meet the requirements of the Project Agreement. The Department will enter verification test results in the QRD. The Department will perform a statistical analysis to ensure that the Developer's IQC test results correlate statistically with the Department verification test results and meet the requirements of the Project Agreement. If the Department determines that the compared test results do not correlate, the Department will follow procedures outlined in the CDOT *Field Materials Manual* for Non-Validation and Status of Material Quality.

6.6.3. Independent Assurance

a. The Department will perform Independent Assurance tests to ensure that:

i. Developer IQC personnel are trained and certified and demonstrate that they understand the test procedures they are performing;

ii. Department verification personnel are trained and certified and demonstrate that they understand the test procedures they are performing;

iii. The test equipment used by the Developer IQC personnel, and Department verification personnel, is calibrated; and

iv. Split sample test results correlate.

b. Independent Assurance test results will also be used as referee tests to assess statistically significant differences, determined by the Department in its sole discretion, between Developer IQC tests and the Department verification test results.

c. IAT will be on a system basis and not a project basis.

6.6.4. Governmental Authority Inspections

Governmental Authorities shall have the right to inspect the Work, provided that the Governmental Authority has jurisdiction over the Work and as required by Law.

6.7. Deliverable Requirements

6.7.1. Quality Management Plan

The Developer shall submit the Stage 1 QMP to the Department for Approval as an NTP1 Condition. The Stage 2 QMP for all remaining Work must have the Department's Approval as an NTP2 Condition. NTP2 will not be issued until the Stage 2 QMP has been Approved by the Department.

6.7.2. Design Deliverables

a. The Developer shall submit to the Department all RFC Documents, revisions to RFC Documents, and As-Built documents.

b. The Developer shall identify on its Project Schedules when RFC Documents and As-Built documents will be submitted to the Department. The schedule shall also reflect changes to the Work as a result of revisions to RFC Documents having been made.

c. The Developer shall provide one set of electronic files of the design deliverables to the Department. As-Built documents shall show all changes. All changes shall be noted using CADD. Hand-drawn changes are not permitted.

d. The design deliverables shall be delivered to the Department indexed and clearly marked to indicate the date of issue and stage of development (e.g., RFC Documents). All design deliverables shall include a title block, consistent with the standard Work drawing format established as part of the QMP, with the following information:

i. Date of issuance and including all prior revision dates;

ii. Contract title and number;

iii. The names of the Developer, sub-consultants, subcontractors, suppliers, and manufacturers, as applicable; and

iv. Subject identification by Developer drawing or Project Agreement reference.

e. All design deliverables shall be sealed by the Developer's engineer consistent with Law. All design deliverables shall include a sufficient blank space, in the lower right corner, just above the title block on the drawings, and in the lower right corner of the title page of specifications and calculations, in which the Developer's engineer may indicate the action taken, indicating his or her review and approval.

f. If a design deliverable requires review approval from a Local Agency or permitting authority, the Developer shall obtain such approval pursuant to Section 5 of Schedule 9.

g. Specifications or CDOT Standard Special Provisions applicable to a design deliverable shall be submitted with the design deliverable.

h. When calculations accompany drawings in a submittal, the body of the calculations shall contain cross-references to the individual drawing to which the pages of the calculations

pertain. Calculations required shall demonstrate conformance with the requirements of the Project Agreement.

i. The CADD drawings and associated documents shall be organized in a logical manner, have a uniform and consistent appearance, and clearly depict the intent of the design and construction. In addition:

i. The software requirements for all submitted design deliverables shall be InRoads/MicroStation, in accordance with the current CDOT standards in effect. Project files shall be organized and submitted in accordance with CDOT's ProjectWise format.

ii. The Developer shall prepare As-Builts for the Work that shall include, but not be limited to, the following:

A. Title sheet;

B. Index;

C. Standard Plan List;

D. Roadway design data;

E. General notes;

F. Pavement details;

G. Roadway details;

H. Drainage details;

I. Geotechnical plans;

J. Environmental mitigation, as necessary;

K. Permanent signing plans and sign structure cross-sections;

L. Signalization plans;

M. Aesthetic elements;

N. Roadway typical sections;

O. Roadway geometric layout plans;

P. Roadway geometric layout tables;

Q. Roadway plan;

R. Roadway profile;

S. Detour construction and phasing plans;

T. Detour construction and phasing profiles;

U. Intersection plans;

V. Pavement plans;

W. Drainage plan;

X. Drainage profiles;

Y. Pavement marking plans;

Z. Utility plans;

AA. Right-of-Way plans, for Developer acquisitions;

BB. Right-of-Way monumentation plans;

CC. ITS, ATM, and Tolling plans;

DD. ITS Communication Network plans;

EE. Landscape/seeding plans;

FF. Grading plans;

GG. Lighting plans;

HH. Bridge plans;

II. Wall and shoring plans;

JJ. Roadway cross sections;

KK. ROW plans for Developer acquisitions;

LL. Estimated material quantities;

MM. Other details, as needed; and

NN. Specifications

iii. The Developer shall provide one set each of electronic files of Utility As-Built documents to the Department and to the respective Utility Owner for Utility Work constructed by the Developer, within 90 Calendar Days after the Utility Owner has accepted the Utility Work. These electronic deliverables shall conform to those requirements set forth in the Project Agreement for CADD requirements, except as modified by the specific requirements of the individual Utility Owners. The Utility As-Built documents shall show locations of existing Utilities, structures, trees, streets, and existing highway ROW limits. Additionally, the Developer shall obtain from each Utility Owner performing its own Utility Relocations Utility As-Built documents for such Utility Relocations showing the foregoing information, and shall deliver one set of electronic files of such documents on DVD to the Department. The Developer shall show this information on the As-Built documents. All As-Built documents electronic files shall be submitted in MicroStation and *.pdf format, or other formats as accepted by the Utility Owner;

iv. CADD files shall be in accordance with the appropriate Department standards. All CADD files shall be documented in a tabular format describing the path, file name, and description.

v. The structure of the reference drawings, Contract Drawings, and CADD files are recommended as a guideline for file setup.

6.7.3. Document and Data Approval

The Developer shall ensure that all deliverables include a signed and dated certification by the originator of the deliverables and that the deliverable is complete and meets the requirements of the Project Agreement.

6.7.4. Document and Data Changes

The Developer shall ensure that any changes to deliverables provided to the Department as revised are in a format that can enable changes to be readily apparent and trackable (e.g., documents use the redline/strikeout method).

6.7.5. Product Data

The Developer shall submit to the Department for Acceptance one electronic copy of all manufacturers' warranties, guarantees, instruction sheets, parts lists, and other product data within 20 Working Days after installation of the items to which they relate, and in any event prior to Substantial Completion. The Developer shall ensure that the product data cited in this Section

is organized and indexed in a manner that allows easy retrieval of information. The Developer shall maintain proper records of product data.

7. SAFETY MANAGEMENT

7.1. General

7.1.1. The Developer shall be responsible for the establishment, control, direction, and implementation of a comprehensive safety plan that protects the safety of its personnel and the general public affected by the Project.

7.1.2. The SMP shall fully describe the Developer's policies, plans, training programs, Site controls, and incident response plans to ensure the health and safety of personnel involved in the Project and the general public affected by the Project during the Term of the Project Agreement. The SMP shall be signed by the Safety Manager, approved (signed) by a member of the Developer's executive management, and shall include Work performed by any Subcontractor.

7.2. Personnel Requirements

7.2.1. The Developer shall provide a Safety Manager with the authority to implement and manage the Developer's SMP. The Safety Manager shall have a high degree of program visibility and shall have authority to perform independent safety evaluations, and to ensure that safety issues are acted on in a timely manner. The minimum experience requirements for the Developer's Safety Manager are a safety professional meeting the following minimum qualifications:

a. Certification as a Safety Professional (CSP) or Certification as an Industrial Hygienist (CIH).

b. A minimum of five years of progressively responsible construction safety experience specifically related to highway capital development projects.

c. A minimum of five years of experience in the development of comprehensive safety programs, policies and procedures including the development and implementation of employee safety training programs.

d. A minimum of five years of experience in occupational safety accident investigation, accident report writing, and OSHA accident reporting.

7.2.2. Resume and qualifications summary for the Developer's Safety Manager shall be provided with the SMP.

7.3. Submittal

7.3.1. The Developer's SMP shall be submitted for Acceptance as an NTP1 Condition and, at a minimum shall include the following:

a. The Developer's commitment and policies on safety and health;

b. Organizational chart identifying all safety management personnel, roles, authorities, and line reporting relationships. Resumes of key safety management personnel shall be provided;

c. Developer's approach to educating, training, and communicating to all workers procedures within the SMP. Safety orientation shall be conducted prior to employees entering the Construction Work area;

d. Procedures for the identification of employees successful completion of safety orientation, and segregation of employees that have not completed safety orientation;

e. Provisions for and the frequency of safety inspections of the Construction Work areas, materials, and equipment to ensure compliance to the SMP, including methods of record keeping and correction of deficiencies;

f. An internal traffic control plan that describes the Developer's method or protocol to coordinate worker, work vehicle, and equipment movements in an activity area of a work zone;

g. Provisions for delineation of responsibilities for reporting and investigating accidents, incidents, exposures, and maintaining logs;

h. Policy for Developer's emergency response, addressing emergency response capabilities and contingency action plans;

i. Policy on the use of Personal Protective Equipment (PPE) for all Construction Work;

j. Developer's detailed Construction Safety Critical Plan which shall include an Erection plan, a Bridge Removal Plan, and a Removal of Portion of Bridge Plan, as applicable, as well as other requirements specified in the Revision of 107 set out in the Project Special Provisions set out in Appendix A to this Schedule 8;

k. Procedures for immediate notification to the Department of all incidents arising out of or in connection with the performance of the Work, whether on or adjacent to the Project; and

l. The SMP is a living document and shall be updated when a process, method, chemical or other Construction Work criteria changes that affects the safety of a person or property. The updated portion of the SMP shall be submitted for Acceptance.

7.3.2. Project staff must be trained on the elements of the Developer's Accepted SMP submittal.

8. DURABILITY PLAN

8.1. Sixty (60) Calendar Days after NTP1 the Developer shall submit for the Department's Acceptance a Durability Plan addressing durability for all Residual Elements with a specified minimum Residual Life of forty (40) years or greater. When developing a design deliverable package that involves a Residual Element with a specified minimum Residual Life of 40 years or greater, the Durability Plan for the relevant Elements in the design package shall be updated and submitted with the final plan sets. The Durability Plan shall indicate the durability design basis and the measures in place to ensure the durability requirements are reflected in the final plan sets. Following completion of the final plan sets and prior to Substantial Completion the Durability Plan shall be submitted to the Department for Acceptance to confirm it addresses durability in relation to the completed final plan sets and that the Plan covers the relevant Residual Elements. The Durability Plan shall be updated as necessary based on this review and submitted for Acceptance.

8.2. Following Substantial Completion the Durability Plan shall be reviewed annually by the Developer to ensure that it is consistent with the Maintenance Management Plan and takes account of improvements in industry practice in testing and forecasting Residual Life. Any changes to testing methodologies shall demonstrate a correlation with the superseded methodology so that previous measurements remain relevant to the accurate prediction of the degradation of the relevant Residual Element. The Developer shall make any updates required and submit to the Department for Acceptance.

8.3. The Durability Plan shall indicate the maintenance and monitoring strategy, outline the process for establishing the Residual Life in order to fulfill the requirements of Schedule 12 (*Handback Requirements*) for each relevant Residual Element, and shall describe a methodology for the replacement of life expired relevant Residual Elements.

8.4. The Durability Plan shall include the following, at a minimum:

a. Identification of each relevant Residual Element with the corresponding environmental exposure conditions for each Element (e.g., buried, submerged, exposed to atmosphere, exposed to corrosive chemicals). Some Elements may be exposed to more than 1 environmental condition (e.g., foundations in water table, foundations in areas with petroleum contamination), which might require different corrosion considerations for each exposure;

b. Identification of relevant degradation and protective mechanisms for each structural Element, quantifying the degradation processes and resistances to these processes with respect to time. The time-related changes in performance for each relevant Residual

Element at intervals not exceeding 10 years up to the end of the required Residual Life. The design life shall be predicted using deterministic models, published industry guidance and test data, allowing for the environmental conditions, and any proposed protective measures. The models and all assumptions shall be clearly indicated in the plan;

c. Description of measures taken during construction to ensure the assumed quality of construction is achieved (e.g., uniform compaction of embankment, adequate concrete cover, proper curing, etc.);

d. Summary of the above information, for each Element, in a tabular format and an estimate of life-cycle costs for the Structure;

e. List of manufacturers of all proposed durability enhancement measures, including coatings, inhibitors, sealers, and membranes;

f. Schedule for corrosion inspection of structural Elements indicating the parameters to be measured in order to confirm the underlying performance relative to that predicted in the design, gathered at intervals of not more than 10 years from Substantial Completion; and

g. Proposed maintenance Schedule for items/materials that could be affected by corrosion.

8.5. Cathodic protection shall not be used to mitigate expected corrosion effects.

8.6. For each Structure, the Developer shall prepare an addendum to the Durability Plan indicating the impact of the as-built condition (including Nonconforming Work and testing data) on the predicted design service life and maintenance and inspection regime.

9. MEETINGS

9.1. Meeting Minutes

Unless notified otherwise by the Department, the Developer shall be responsible for developing meeting minutes for all Project related meetings between the Developer and the Department or the Enterprises, between the Developer and counterparties to Third Party Agreements, and between the Developer and other Governmental Agencies and stakeholders. All meeting minutes shall be submitted to the Department within four Working Days following the meeting either for Acceptance where expressly provided in the Project Agreement or otherwise for Information.

9.2. Task Force Meetings

9.2.1. At a minimum, the Developer shall conduct and take meeting minutes of task force meetings for the following disciplines to facilitate “over the shoulder” review of the design:

a. Drainage;

b. Roadway;

c. Structures;

d. Traffic/ITS/tolling;

e. Maintenance of Traffic (refer to Schedule 10, Section 2 Maintenance of Traffic for further requirements related to such meetings);

f. Fire and Life Safety;

g. Cover;

h. Utilities;

i. Right-of-Way;

j. Environmental (refer to Schedule 17 *(Environmental Requirements)* for further requirements related to such meetings); and

k. Strategic Communications.

9.2.2. Meeting minutes for each task force shall be provided to the Department within four Working Days following the meeting for Acceptance.

9.3. Design Progress Review Meetings

The Developer shall hold Design Progress Review Meetings as described in Section 6.4.2 of this Schedule 8. Meeting minutes will be documented and submitted to the Department for Acceptance within four Working Days after each meeting.

9.4. Safety Meetings

The Developer shall conduct regularly scheduled project safety meetings, tool box talks, etc., as specified in its SMP.

9.5. Quality Meetings

The Developer shall conduct weekly quality meetings with representatives from Quality Control, Quality Assurance, and the Department, in accordance with this Schedule 8.

10. PHOTOGRAPHS AND VIDEO

10.1. Pre-Construction Photographs and Video

The Developer shall take a sufficient number of pre-construction photographs and a 1080p HD resolution, or greater, video of the Site, including roadways, structures, drainage, and all areas necessary and/or anticipated to be impacted by the Construction Work in HD format so as to resolve any disputes which may arise regarding the conditions prior to and subsequent to construction. Such preconstruction photo and video survey shall be completed prior to the NTP1 and data provided to the Department for Information. If a dispute arises where no or insufficient photographic or video evidence of its existing condition is available, the disputed area shall be restored to the extent directed by the Department at no additional cost to the Department.

10.2. Progress Photographs

10.2.1. At a minimum, the Developer shall take eight megapixel resolution or greater, aerial photographs of the Construction Work and Site every three months. Aerial photographs shall include all areas under construction, whether temporary or permanent, and all other areas impacted, each time they are taken. One series of oblique photographs shall be taken from one direction along the corridor. The Department's confirmation shall be sought regarding views to be taken and the approximate time at which they will be taken;

10.2.2. The Developer shall provide the Department one complete set of high quality aerial photographs on DVD. The file format shall be .jpg, .gif, or .tiff; and

10.2.3. The Developer shall provide interior and exterior photographs of each buried structure, just prior to burial. Provide a minimum of four internal views (as applicable) and four external views of each structure. Place the following information on the front of digital photographs:

a. Date photograph was taken;

b. Title of Project;

c. Description of view shown in photograph;

d. Identification of photographer; and

e. Sequential number of photograph.

10.3. Time Lapse Photography

The Developer shall provide a continuous time-lapse photo of the viaduct area of the Project from the point of NTP1 to Final Acceptance. Time-lapse camera shall be positioned at a location determined by the Department. Photos shall be uploaded to the Project website in real-time. Resolution shall be 12 megapixels or greater. Camera shall be capable of continuous streaming of data to the web.

11. FACILITIES PROVIDED BY DEVELOPER

11.1.1. The Developer shall provide all office space, equipment, and vehicles as required for the Project. The Developer shall provide space and facilities to allow the Department's staff to co-locate with the Developer's staff. "Co-locate" shall mean located within the same building or office complex.

11.1.2. The Developer shall make available its proposed facilities for inspection and Acceptance by the Department prior to the Department occupying any Developer provided facilities. Developer shall obtain Acceptance by the Department no later than 30 Calendar Days after NTP1. Both parties shall participate in a facility condition inspection prior to and at the completion of occupancy. The Department shall return possession of Developer provided facilities to the Developer in the same condition as when the Department initially occupied the facilities, except for reasonable wear and tear.

11.1.3. The Developer shall secure sites, obtain all site Permits, install, set up, and provide Utility services, and maintain the facilities as part of the Construction Work.

11.1.4. In the event that office spaces or appurtenant facilities are stolen, destroyed, or damaged during the Construction Work, the Developer shall at its expense repair or replace those items provided to their original condition within five Working Days, or as Accepted by the Department, except for any loss or damage caused as a direct result of willful misconduct of Department personnel, which the actual, reasonable, and documented costs of the repair, replacement, and/or restoration will be reimbursed by the Department.

11.1.5. The Developer shall provide office space (the Department offices) and equipment for 50 Department personnel, including at least 10 private offices, specified herein. The Department offices shall meet the BOMA Class B definition for the North Denver Area, similar to the space provided for the US36 project.

a. The proposed facilities shall be located within a one and a half mile radius of I-70 between I-25 and Quebec Street. The Developer shall be required to furnish the Department's staff with offices that are in good and serviceable condition (condition comparable to the Developer's office space);

b. The Developer shall maintain the Department offices until at least Final Acceptance unless otherwise agreed to by the Department. The Department may, at its option, vary the number of its staff throughout the duration of the Project. However, the Developer shall maintain the initial number and size of the Department offices, conference rooms, reception area, break room and filing area (the Department Office Facilities) until Final Acceptance following the Construction Period;

c. The Developer shall be responsible for disposal or removal of all the Department office facilities and any site restoration Construction Work required;

d. The Developer shall provide:

i. Telephones and telephone service with at least one outside line for each Department office, reception area, conference rooms, break room, and filing room;

ii. High-speed Internet connection (100 megabyte/sec or greater, synchronous transfer rate business class Ethernet system) and networking for all offices and conference rooms;

iii. A server room (seven feet x 10 feet minimum) for the Department's sole use with supplemental air conditioner if internal air conditioner cannot keep the room (with Department installed server equipment) at or below 75 degrees at all times. This room shall be no further than 300 feet from the farthest cube/office. Electrical in the server room shall consist of two 20-AMP 120V circuits with 2 National Electrical Manufacturers Association (NEMA) 5-15 and 1 NEMA 5-20 outlet on each circuit;

iv. Overhead lighting meeting Occupational Safety & Health Administration (OSHA) and code requirements for office space;

v. Two color laser printer/copiers capable of 45 ppm input and output at 600 x 600 dpi and at least two paper drawers accepting 8-1/2 x 11 inch up to 11 x 17 inch paper and paper weights from 16 to 24 lb. bond, including paper, toner, service and repairs. The unit shall be capable of scanning documents to 11 x 17 inch size and transmitting the scanned file to multiple email addresses; and

vi. Office space not less than the size indicated below:

A. Private offices shall be 150 square feet of enclosed office space (with individual locking door) per office;

B. Partitioned office shall be 100 square feet enclosed office space per office (cubicles/partitions are acceptable);

C. One enclosed conference room with doors capable of accommodating a 30 person meeting, with at least 50 percent of seating capacity at the conference table. This can be a shared conference room between the Developer and the Department, provided that the Department shall be afforded exclusive access during 50 percent of the working hours between 7:00 am and 5:00 pm;

D. One enclosed conference room with doors for the Department's exclusive use capable of accommodating a 20 person meeting, with a 15 person seating capacity at the conference table. The conference room shall be in an adjacent space to the Department Offices;

E. Break room shall be 150 square feet with sink, counter, microwave, and 20 cubic- foot refrigerator, and drinking water and dispenser;

F. Filing space shall be enclosed, with lockable door and 15 steel, five-drawer, locking, lateral file cabinets (approximate size shall be 18 inches by 42 inches). The file room shall also have two 30 x 72-inch utility tables with two chairs each. This space shall be of sufficient size to accommodate the requested equipment and accommodate four staff members (to typical industry standards). This space shall not be shared with any other room;

G. One reception area with common access to the Department Offices; and

H. Storage room: 150 square feet, enclosed with lockable door.

e. Furnishings, as follows:

i. Conference Room

A. Conference table and chairs;

B. Wastebasket; and

C. Hanging, erasable white board that is four feet by six feet minimum.

ii. Offices

A. Desk that is minimum size 76 x 36 inches with locking drawers and keys;

B. Computer workstation desk capable of holding a desktop printer, monitor, keyboard, and any accessories;

C. Worktable (private offices only);

D. Ergonomically correct, OSHA-approved chairs;

E. Extra office chair;

F. Wastebasket;

G. Hanging, erasable white board, minimum three feet by four feet (private offices only); and

H. Bookshelf.

f. Indoor restrooms suitable for number of offices and personnel, including separate facilities for men and women;

g. Hard-surfaced (paved) parking, one space per employee, plus 10 visitor spaces (50 total);

h. Daily janitorial service;

i. Maintenance of the exterior area of office, including access to parking and snow removal;

j. Facilities that meet American with Disabilities Act (ADA) access requirements and meet all local code requirements for office space;

k. Heating, ventilation and air conditioning/cooling systems capable of maintaining an office temperature range of between 68 degrees and 76 degrees (Fahrenheit);

l. 24 hours a day, seven days a week secure access; and

m. A secure single point visitor check in location and staffing to direct visitors to the appropriate team member.

11.1.6. Design-Build Field Laboratory (Owner Verification Testing)

The Developer shall provide two Field Laboratories, Class 2, as per CDOT *M & S Standard Plans*, at a location to be agreed upon by the Department and the Developer. The field Laboratories shall have a minimum of three parking spaces per trailer, all contained within a security fence. The field Laboratories shall be provided to the Department at least 15 Working Days prior to commencement of any field activities involving earthwork of any type, analysis of mix designs, or planned placement of Portland cement concrete pavement (PCCP) or hot bituminous pavement (HBP) and shall have a forced air oven and high-speed Internet connection.

11.1.7. Project Vehicles

a. The Developer shall, within 30 Calendar Days after NTP1, provide 2- 2017-2018 (110 cu. ft. EPA passenger volume or greater) five-passenger, four-wheel drive, Crossover sport utility vehicles, 6- 2017-2018 (150 cu. ft. EPA passenger volume or greater) seven-passenger, four-wheel drive, Crossover sport utility vehicles, and 4- 2017-2018 four-wheel drive Crew Cab (full-size class) pickups, including delivery charges, full service, all applicable taxes, and full coverage insurance, license plate fees, all maintenance, and all other cost inherent to provisions of said vehicles, excluding fuel expense. The vehicles shall be used exclusively by the Department's staff until Final Acceptance;

b. The Project Vehicles shall:

i. Be new, white in color, and complete with all standard equipment;

ii. Comply with the Motor Vehicle Safety Standards, as established by the U.S. Department of Transportation;

iii. Have Developer maintained ownership and title of the vehicles during the period they are in the possession of the Department; and

iv. In case of fire, theft, accident, or breakdown, be repaired or replaced within 48 hours of such occurrence.

c. General equipment for the vehicles shall include:

i. Four Door;

ii. Engine – standard available for each identified model type;

iii. Tires and wheels – standard size for each identified model type, with all season steel-belted radial tires;

iv. Power anti-lock brakes and power steering;

v. Automatic transmissions;

vi. Vinyl floor mats;

vii. Rear window wiper and defroster – electric type (Crossover sport utility type only);

viii. Directional signals with 4-way flasher;

ix. Inside rear view mirror – day/night type;

x. Exterior mirrors – left and right mounted, power adjustable;

xi. Air conditioner/heater;

xii. Radio – AM/FM push-button (minimum);

xiii. Windshield wipers – variable speed with intermittent control; and

xiv. Hood release – inside vehicle.

d. General vehicle light bar shall be as follows:

i. Five-passenger Crossover sport utility vehicles shall be equipped with two amber LEDs on the front grille or one within each headlamp lens, two amber LEDs on the lower portion of the rear liftgate or one within each tail lamp lens, two amber LEDs mounted to the rear portion of the interior headliner and facing to the rear so as to be visible through the rear window, and a full-length light bar (type: Whelen Justice or equivalent) affixed to the roof. The light bar shall be mounted as close to center of the vehicle as practicable but may be mounted rearwards if it is deemed to be more visible. The light bar shall be amber with white work lights to the front, rear, and sides. The light bar shall be wired so that it is operable while the engine is on and off.

ii. Seven-passenger Crossover sport utility vehicles shall be equipped with two amber LEDs on the front grille or one within each headlamp lens, two amber LEDs on the lower portion of the rear liftgate or one within each tail lamp lens, an amber dual LED mounted to the front portion of the interior headliner and visible to the front, an amber dual LED mounted in each rear side window and visible to the sides, and a traffic indicator (type: Whelen Dominator Plus 6 or equivalent) mounted inside the rear window, as high as practicable, so as to be visible to the rear.

iii. Pickup trucks shall be equipped with two amber LEDs on the front grille or one within each headlamp lens, two LEDs within the tail lamp lenses, and a full-length light bar (type: Whelen Justice or equivalent) mounted to the top of the cab, centered approximately between the front and rear axles. Pickup trucks equipped with headache racks shall have the light bar affixed to the top of the headache rack rather than to the cab roof. The light bar shall be wired so that it is operable while the engine is on and off.

iv. Light bars and LEDs shall be programmed to flash amber and white alternately to increase visibility.

e. Vehicle Graphics shall be as follows:

i. All Developer provided Project vehicles shall be equipped with one row of high-visibility reflective chevrons, approximately 4” tall and spanning the width of the vehicle, to be mounted to the rear bumper. If the vehicle is equipped with a split rear bumper, the chevrons may be affixed to the lowest portion of the rear tailgate or liftgate practicable. Adjustments for manufacturer’s logos and body lines are

permitted within reason. Chevrons should be placed with consideration for maximum visibility.

12. PROJECT DIRECTORY

The Developer shall furnish and maintain to the Department a Project Directory listing the names, addresses and telephone numbers (office, home, cellular, etc.) of the Key Personnel and critical support staff of the Developer and each Subcontractor. The Project Directory shall be submitted to the Department, prior to issuance of the NTP1, for Information. The Developer shall update the Project Directory quarterly for the duration of the Construction Work and with any Key Personnel changes.

13. DOCUMENT MANAGEMENT

13.1. General Requirements

13.1.1. The Developer shall establish and maintain its own Document Control System (DCS) to store and record all correspondence, drawings, progress reports, technical reports, specifications, deliverables, calculations, and administrative documents generated under the Project Agreement. The Developer shall also establish correspondence routing, filing, control, and retrieval methods that are compatible with the Department's DCS. Document Control, storage, and retrieval methods shall include the use of both hard copies and electronic records. The Developer's DCS shall handle all documents.

13.1.2. The Department will use Aconex as its DCS, a web-based information management system. Aconex will be the only recognized method for transmittal of formal project correspondence, documents and information (other than for service of legal process). Where it is necessary to transmit original signed documents, these shall be acceptable forms of correspondence only when they have been issued via Aconex first. The provisions of this Section 13.1.2 are subject to the provisions of Section 1.2.7 of Schedule 15.

13.1.3. The Developer shall use the Department's Aconex system when communicating with the Department. This includes use for all Document Control related documents, transmitting deliverables, and email correspondence purposes for the duration of the Project. The Aconex system will be used by all participants engaged on this Project, including Subcontractors of any tier, Suppliers and their subsequent legal successors in title. It is the Developer's responsibility to ensure consistency with this procedure subject to the provisions of Section 1.2.7 of Schedule 15.

13.1.4. Access to the Department's Aconex system and web-based certified and payroll and contractor compliance system will be provided to the Developer and all Subcontractors free of charge for the duration of the Project.

13.1.5. The Department, at its sole discretion, may elect to use an alternative DCS during the course of the Term. In such case, the Developer shall use this alternative DCS for all correspondence with the Department as described herein.

13.1.6. All correspondence of the Developer to and from the Department and its representatives with respect to the Project shall be categorized and serialized by a method Accepted by the Department. The Developer shall maintain separate incoming and outgoing correspondence logs. Developer correspondence serialization shall be submitted for Acceptance by the Department prior to NTP1.

13.1.7. The following is the minimum criteria that the Developer's DCS shall provide:

a. Access shall be provided to the Department on a real-time basis that can only be attained through the Internet. The Developer shall maintain industry standards for Internet connectivity as determined by the Department.

b. The Developer's incoming and outgoing correspondence logs shall be available to the Department within 24 hours.

c. Documents within the Developer's DCS must be transferable to the Department's DCS. The transfer of documents shall be performed through the Internet.

d. The Department and CCD shall have read only access to the latest set of drawings that are produced during the Construction Period.

e. Process Control (PC) and Independent Quality Control (IQC) data, such as test results, daily inspection records, non-conformance reports, etc., shall be stored by the Developer within their DCS. Real-time access by the Department to PC/IQC data shall be required. PC/IQC data shall be transferred to the Department's DCS on a monthly basis.

14. DELIVERABLES

At a minimum, the Developer shall submit the following to the Department for Information, Acceptance, or Approval in accordance with the timeframes specified below:

Table 2 Deliverables

Deliverable	Information, Acceptance, or Approval	Schedule
Project Management Plan (PMP)	Acceptance	Prior to the issuance of NTP1, updated annually
WBS	Acceptance	Prior to the issuance of NTP1
Baseline Schedule	Acceptance	Prior to the issuance of NTP1
Revised Baseline Schedule	Acceptance	Upon the Department's or Developer's request
Draw Down Schedule	Information	Prior to the issuance of NTP1
Progress Report format	Approval	Within 10 Working Days after the issuance of NTP1
Progress Report	Acceptance	10 Working Days following prior month's end
Schedule Work Plan	Acceptance	Prior to the issuance of NTP1
Monthly Progress Schedule	Acceptance	Concurrent with each Progress Report
Maintenance Progress Report	Information	Concurrent with each Progress Report
Record Schedule	Acceptance	Concurrent with final Progress Report
Developer Provided Facilities	Acceptance	30 Calendar Days after NTP1
Pre-construction photo and video survey	Information	Prior to the issuance of NTP1
Project Directory	Information	Prior to the issuance of NTP1
Developer DCS correspondence categorization and serialization method	Acceptance	Prior to the issuance of NTP1
Safety Management Plan (SMP)	Acceptance	Prior to the issuance of NTP1
Stage 1 Quality Management Plan (QMP)	Approval	Prior to the issuance of NTP1
Stage 2 Quality Management Plan (QMP)	Approval	Prior to the issuance of NTP2

Deliverable	Information, Acceptance, or Approval	Schedule
Updates to Stage 1 or Stage 2 QMP	Approval	As needed to document changes to quality program
Evidence of ASQ certification of IQCM and CPCM as per Section 6.2.7.f of this Schedule 8	Information	Prior to the issuance of NTP2
Durability Plan	Acceptance	60 Calendar Days after the issuance of NTP1; following completion of final plan sets and prior to Substantial Completion; annually thereafter
Meeting Minutes to be submitted for Acceptance per the Project Agreement	Acceptance	Four Working Days after meeting
Preliminary (30% level) plan package	Acceptance	As defined in Project Schedules
Meeting minutes, other than those required to be Accepted	Information	Four Working Days after meeting
Task force meeting minutes	Acceptance	Four Working Days after meeting
Design progress review meeting minutes	Acceptance	Four Working Days after meeting
Quality Manager reports the status of the Work's quality	Information	Monthly
Materials Testing and Inspection Plan (MTIP)	Approval	Concurrent with QMP
Materials Testing and Inspection Plan (MTIP)	Acceptance	Concurrent with RFC Documents
Summary of activity-specific Material quantities	Acceptance	Monthly
Final (100% level) plan sets	Acceptance	As required by Schedule 10
Release for Construction Documents	Acceptance	As required by Schedule 10
Revisions to Release for Construction Documents	Acceptance	As required by Schedule 10
As-Built Documents	Acceptance	As required by Schedule 10

Deliverable	Information, Acceptance, or Approval	Schedule
One electronic copy of all manufacturers' warranties, guarantees, instruction sheets, parts lists, and other product data	Acceptance	Within 20 Working Days after installation of the items to which they relate, and in any event prior to Substantial Completion
COC/CTR log	Acceptance	Prior to Substantial Completion
IQC test measurements and test results	Information	Within 24 hours following inspection or test completion
Weekly look ahead of specific scheduled construction activities	Information	Weekly
Description of actual construction activities conducted during the previous Week	Information	Weekly
Nonconformance Report	Approval	As required by Section 6.5 of this Schedule 8
Nonconforming Work log	Acceptance	Weekly
Corrective Action Plan	Approval	As required by Section 6.5 of this Schedule 8
Punch Lists and Punch List logs	Approval	As required by Part 7 of Schedule 3

15. APPENDICES

Appendix A Project Special Provisions

Appendix B Certificates for Construction Work Completion

Appendix A
Project Special Provisions

The following specifications modify and take precedence over the Standard Specifications. The provisions of Appendix A to Schedule 10A *(Applicable Standards and Specifications)* apply to these Project Special Provisions.

PROJECT SPECIAL PROVISIONS

	Page
Index	8-50
Revision of Section 107 – Performance of Safety Critical Work	8-51 to 8-53

REVISION OF SECTION 107
PERFORMANCE OF SAFETY CRITICAL WORK

Section 107 of the Standard Specifications is hereby revised as follows:

Add subsection 107.061 immediately following subsection 107.06 as follows:

107.061 Performance of Safety Critical Work. The following work elements are considered safety critical work for this project:

(a) Overhead girder erection

(b) Overhead structure construction or repair

(c) Removal of bridge

(d) Removal of portion of bridge

(e) Temporary works: falsework, shoring that exceeds 5 feet in height, cofferdams, and temporary bridges

(f) Work requiring the use of cranes or other heavy lifting equipment to set a girder, to make overhead repairs, or includes special provisions for Removal of Bridge or Removal of Portion of Bridge. Also when construction materials are being lifted that may fall onto active traffic lanes.

(g) Blasting

(h) Excavation and embankment adjacent to the roadway, especially if it requires shoring

(i) Tunneling

(j) Work operations such as pile driving and jack hammering which may create vibration and cause debris to fall into traffic.

(k) Rockfall mitigation

The Contractor shall submit, for record purposes only, an initial detailed construction plan that addresses safe construction of each of the safety critical elements. When the specifications already require an erection plan, a bridge removal plan, or a removal of portion of bridge plan, it shall be included as a part of this plan. The detailed construction plan shall be submitted two weeks prior to the safety critical element conference described below. The construction plan shall be stamped “Approved for Construction” and signed by the Contractor. The construction plan will not be approved by the Engineer.

The Construction Plan shall include the following:

(a) Safety Critical element for which the plan is being prepared and submitted.

(b) Contractor or subcontractor responsible for the plan preparation and the work.

(c) Schedule, procedures, equipment, and sequence of operations, that comply with the working hour limitations

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REVISION OF SECTION 107
PERFORMANCE OF SAFETY CRITICAL WORK

(d) Temporary works required: falsework, bracing, shoring, etc.

(e) Additional actions that will be taken to ensure that the work will be performed safely.

(f) Names and qualifications of workers who will be in responsible charge of the work:

1. Years of experience performing similar work
2. Training taken in performing similar work
3. Certifications earned in performing similar work

(g) Names and qualifications of workers operating cranes or other lifting equipment

1. Years of experience performing similar work
2. Training taken in performing similar work
3. Certifications earned in performing similar work

(h) The construction plan shall address how the Contractor will handle contingencies such as:

1. Unplanned events (storms, traffic accidents, etc.)
2. Structural elements that don't fit or line up
3. Work that cannot be completed in time for the roadway to be reopened to traffic
4. Replacement of workers who don't perform the work safely
5. Equipment failure
6. Other potential difficulties inherent in the type of work being performed

(i) Name and qualifications of Contractor's person designated to determine and notify the Engineer in writing when it is safe to open a route to traffic after it has been closed for safety critical work.

(j) Erection plan or bridge removal plan when submitted as required elsewhere by the specifications. Plan requirements that overlap with above requirements may be submitted only once.

A safety critical element conference shall be held two weeks prior to beginning construction on each safety critical element. The Engineer, the Contractor, the safety critical element subcontractors, and the Contractor's Engineer shall attend the conference. Required pre-erection conferences or bridge removal conferences may be included as a part of this conference.

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REVISION OF SECTION 107
PERFORMANCE OF SAFETY CRITICAL WORK

After the safety critical element conference, and prior to beginning work on the safety critical element, the Contractor shall submit a final construction plan to the Engineer for record purposes only. The Contractor's Engineer shall sign and seal temporary works, such as falsework, shoring etc., related to construction plans for the safety critical elements, (3) Removal of Bridge, (4) Removal of Portion of Bridge and (5) Temporary Works. The final construction plan shall be stamped "Approved for Construction" and signed by the Contractor.

The Contractor shall perform safety critical work only when the Engineer is on the project site. The Contractor's Engineer shall be on site to inspect and provide written approval of safety critical work for which he provided signed and sealed construction details. Unless otherwise directed or approved, the Contractor's Engineer need not be on site during the actual performance of safety critical work, but shall be present to conduct inspection for written approval of the safety critical work.

When ordered by the Engineer, the Contractor shall immediately stop safety critical work that is being performed in an unsafe manner or will result in an unsafe situation for the traveling public. Prior to stopping work, the Contractor shall make the situation safe for work stoppage. The Contractor shall submit an acceptable plan to correct the unsafe process before the Engineer will authorize resumption of the work.

When ordered by the Engineer, the Contractor shall remove workers from the project that are performing the safety critical work in a manner that creates an unsafe situation for the public in accordance with subsection 108.05.

Should an unplanned event occur or the safety critical operation deviate from the submitted plan, the Contractor shall immediately cease operations on the safety critical element, except for performing any work necessary to ensure worksite safety, and provide proper protection of the work and the traveling public. If the Contractor intends to modify the submitted plan, he shall submit a revised plan to the Engineer prior to resuming operations.

All costs associated with the preparation and implementation of each safety critical element construction plan will not be measured and paid for separately, but shall be included in the work.

Nothing in the section shall be construed to relieve the Contractor from ultimate liability for unsafe or negligent acts or to be a waiver of the Colorado Governmental Immunity Act on behalf of the Department.

Appendix B Certificates for Construction Work Completion

COLORADO HIGH PERFORMANCE TRANSPORTATION ENTERPRISE

- and -

COLORADO BRIDGE ENTERPRISE

- and -

KIEWIT MERIDIAM PARTNERS LLC

PROJECT AGREEMENT FOR THE CENTRAL 70 PROJECT

CERTIFICATE OF DESIGN MANAGER

I, [*NAME OF DESIGN MANAGER*], certify as follows:

1. I am the Design Manager appointed by Kiewit Infrastructure Co. to manage the design of the Construction Work.

2. To the best of my knowledge, information and belief, the design documents submitted in connection with all Construction Work performed to achieve [Milestone Completion of Milestone No. [ ] [Substantial Completion] [Final Acceptance] meet the requirements of the Project Agreement.

Signed

_____

[*Name*]

_____

[*Date*]

COLORADO HIGH PERFORMANCE TRANSPORTATION ENTERPRISE

- and -

COLORADO BRIDGE ENTERPRISE

- and -

KIEWIT MERIDIAM PARTNERS LLC

PROJECT AGREEMENT FOR THE CENTRAL 70 PROJECT

CERTIFICATE OF PROJECT MANAGER

I, [*NAME OF MANAGER*] certify as follows:

1. I am the Project Manager appointed by Kiewit Meridiam Partners LLC to manage the Work.

2. To the best of my knowledge, information and belief, all Construction Work performed to achieve [Milestone Completion of Milestone No. [ ]] [Substantial Completion] [Final Acceptance] meets the requirements of the Project Agreement.

Signed

_____

[*Name*]

_____

[*Date*]

COLORADO HIGH PERFORMANCE TRANSPORTATION ENTERPRISE

- and -

COLORADO BRIDGE ENTERPRISE

- and -

KIEWIT MERIDIAM PARTNERS LLC

PROJECT AGREEMENT FOR THE CENTRAL 70 PROJECT

CERTIFICATE OF PROJECT QUALITY MANAGER

I, [*NAME OF PROJECT QUALITY MANAGER*], certify as follows:

1. I am the Project Quality Manager appointed by Kiewit Meridiam Partners LLC to manage the Construction Work.

2. To the best of my knowledge, information and belief, there are no outstanding non-conformances in the Construction Work performed to achieve [Milestone Completion of Milestone No. [ ]] other than those identified on the Approved Milestone Completion Punch List attached to this certificate] [Substantial Completion other than those identified on the Approved Substantial Completion Punch List attached to this certificate] [Final Acceptance].

Signed

_____

[*Name*]

_____

[*Date*]

Schedule 9
Submittals

1. Definitions

The following terms have the respective meanings set out below for all purposes of this Schedule 9:

"Deliverable for Acceptance"	means any Deliverable that, pursuant to this Agreement, must be submitted either: (a) for Acceptance; or (b) for consent, approval or like assent, to the extent that the Department is or the Enterprises are, as applicable, pursuant to the express provisions of this Agreement, required to act reasonably in deciding whether to give such consent, approval or like assent.
"Deliverable for Approval"	means any Deliverable that, pursuant to this Agreement, must be submitted either: (a) for Approval; or (b) for consent, approval or like assent, to the extent that such is, pursuant to the express provisions of this Agreement or pursuant to Section 2.2.4.b of the Project Agreement, in, as applicable, the Department's or the Enterprises' discretion.
"Deliverable for Information"	means any Deliverable that, pursuant to this Agreement, must be submitted by Developer for Information.
"Deliverable for Third Party Review"	means any Reviewable Deliverable that requires review or approval by a Governmental Authority, Utility Owner, Railroad or other third Person in addition to the review or approval by the Department or the Enterprises.
"DRTL"	has the meaning given to it in Section 7(a) of this Schedule 9.
"Restricted Activity"	has the meaning given to it in Section 3(a) of this Schedule 9.
"Reviewable Deliverable"	means any Deliverable that is a Deliverable for Approval, a Deliverable for Acceptance or a Deliverable for Information.
"RFC Deliverable"	means any RFC Document that is a Deliverable.

2. General

(a) This Schedule 9 shall govern all Reviewable Deliverables to be submitted either to the Department or the Enterprises pursuant to this Agreement.

(b) For purposes of Sections 3, 4, 6 and 9 of this Schedule 9 only, any reference to:

(i) "Acceptance", "Accept", "Acceptable" or "Accepted" shall be deemed to include any other form of consent, approval or like assent to the extent that the Department is or the Enterprises are, as applicable, pursuant to the express provisions of this Agreement:

(A) required to act reasonably in deciding whether to give; or

(B) otherwise precluded from unreasonably withholding,

such consent, approval or like assent; and

(ii) "Approval", "Approve" or "Approved" shall be deemed to include any other form of consent, approval or like assent to the extent that such is, pursuant to the express provisions of this Agreement or pursuant to Section 2.2.4.b of the Project Agreement, in, as applicable, the Department's or the Enterprises' discretion.

(c) Developer shall develop and implement procedures for handling, storing, packing, tracking and submitting Reviewable Deliverables as part of its Quality Management Plan pursuant to Section 6.2.1.f.xviii of Schedule 8 (*Project Administration*). Such procedures shall comply, and be consistent, with this Schedule 9.

3. **Restrictions on Work Prior to Review**

(a) Except to the extent expressly permitted by Section 3(b) of this Schedule 9, Developer shall not commence or perform, and shall ensure that none of its Subcontractors nor any of their respective Subcontractors shall commence or perform, any part of the Work (each such part, a "Restricted Activity") to the extent that such Restricted Activity is the subject of, governed by or otherwise conditioned on the submission, review, Approval or Acceptance of any Reviewable Deliverable unless and until:

(i) in respect of a Deliverable for Approval:

(A) either the Department or the Enterprises, as applicable, has unconditionally Approved such Reviewable Deliverable; or

(B) (I) either the Department or the Enterprises, as applicable, has conditionally Approved such Reviewable Deliverable pursuant to Section 6(b)(i)(B) of this Schedule 9, (II) Developer has, as applicable, complied with or responded to, or agreed in writing to comply with or respond to, all relevant conditions and comments related to such Reviewable Deliverable and (III) no resubmission of such Reviewable Deliverable is required either (x) as a result of the application of Section 9(b)(ii) of this Schedule 9 or (y) pursuant to Section 9(d) of this Schedule 9;

(ii) in respect of a Deliverable for Acceptance:

(A) either the Department or the Enterprises, as applicable, has unconditionally Accepted such Reviewable Deliverable;

(B) (I) either the Department or the Enterprises, as applicable, has conditionally Accepted such Reviewable Deliverable pursuant to Section 6(b)(ii)(B) of this Schedule 9, (II) Developer has, as applicable, complied with or responded to, or agreed in writing to comply with or respond to, all relevant conditions and comments related to such Reviewable Deliverable and (III) no resubmission of such Reviewable Deliverable is required either (x) as a result of the application of Section 9(b)(ii) of this Schedule 9 or (y) pursuant to Section 9(d) of this Schedule 9; or

(C) if either the Department has or the Enterprises have, as applicable: (I) failed to respond in any way to such Reviewable Deliverable within any applicable period determined in accordance with Sections 6(a)(i) and 6(a)(ii) of this Schedule 9; and (II) subsequently failed to respond to any notice regarding such failure as determined in accordance with Section 6(a)(iv) of this Schedule 9,

in which event the Department or the Enterprises, as applicable, shall be deemed to have unconditionally Accepted such Reviewable Deliverable; and

(iii) in respect of a Deliverable for Information, either the Department or the Enterprises, as applicable, has had at least 15 Working Days to review and comment on such Reviewable Deliverable after it was first submitted.

(b) Notwithstanding Section 3(a) of this Schedule 9, Developer may itself, and may permit its Subcontractors to, commence or perform any Restricted Activity prior to Developer, or any such Subcontractor, otherwise being permitted to do so pursuant to Section 3(a) of this Schedule 9:

(i) if the Restricted Activity is the subject of, governed by or otherwise conditioned on the submission, review or Acceptance of any Deliverable for Acceptance or any Deliverable for Information; and

(ii) only to the extent permitted by any Approved Quality Management Plan,

provided that:

(A) for certainty, this Section 3(b) of this Schedule 9 shall in no circumstance apply to any Restricted Activity that is the subject of, governed by or otherwise conditioned on the submission, review or Approval of any Deliverable for Approval;

(B) any Restricted Activity undertaken by Developer, or any Subcontractor, pursuant to this Section 3(b) shall be conducted at Developer's sole cost and risk without prejudice to the Department's and the Enterprises' continuing rights of review, comment and Acceptance of any relevant Reviewable Deliverables under this Schedule 9; and

(C) Developer shall at all times remain responsible for complying with the outcome of the Department's and the Enterprises' review, comment and Acceptance process under this Schedule 9, at Developer's sole cost and risk, including any and all reconstruction, alterations, modifications or other remedial work to Work already completed as may be necessary to comply with such outcome.

4. **Submission of Deliverables**

(a) Each Reviewable Deliverable submission shall:

(i) include a signed and dated certification by Developer in form and substance reasonably Acceptable to the Department or the Enterprises, as applicable, that such Reviewable Deliverable is complete, is suitable for the purpose for which it is submitted and meets the requirements of this Agreement; and

(ii) be accompanied by such supplemental reference information and materials as are reasonably requested by the Department or the Enterprises in advance.

(b) Developer may resubmit any previously submitted Deliverable for Approval or Deliverable for Acceptance, as applicable, that was not previously Approved or Accepted, or otherwise consented to, approved or assented to, without conditions, provided that Developer clearly identifies and documents in its resubmission how all prior conditions and comments have been addressed.

5. **Third Party Review**

(a) Developer shall submit to either the Department or the Enterprises, as applicable, each Deliverable for Third Party Review concurrently with its submission to the relevant Governmental Authority, Utility Owner, Railroad or other third Person, except:

(i) with respect to any Deliverable for Third Party Review that:

(A) is to be submitted to the FHWA or which involves a Department Provided Approval, which Deliverable for Third Party Review Developer is

obligated to first submit to the Enterprises pursuant to Section 8.4.3.a of the Project Agreement;

(B) is a design Deliverable to be submitted to the BNSF pursuant to the BNSF RRA, which must be Approved or Accepted by the Department, as applicable, prior to submission to the BNSF; or

(C) the Department or the Enterprises, as applicable, has or have notified Developer must be reviewed and/or approved:

(I) by the Department or the Enterprises, as applicable, prior to submission to any relevant Governmental Authority, Utility Owner, Railroad or other third Person; or

(II) by the relevant Governmental Authority, Utility Owner, Railroad or other third Person prior to submission to the Department or the Enterprises, as applicable; or

(ii) as otherwise expressly provided for in this Agreement.

(b) Except as otherwise expressly provided for in this Agreement, neither the Department nor the Enterprises, as applicable, shall be obligated to provide Developer with a written response on any Deliverable for Third Party Review that is subject to concurrent review under Section 5(a) of this Schedule 9 until the relevant Governmental Authority, Utility Owner, Railroad or other third Person has formally provided a response or granted approval (conditional or otherwise) to it, at which time, as applicable, the Department or the Enterprises will provide a written response within five Working Days or, if later, by the date otherwise required pursuant to Section 6(a) of this Schedule 9.

6. **Review Process**

(a) Subject to Sections 5(b) and 8 of this Schedule 9, the Department or the Enterprises, as applicable, will provide Developer with a written response to each Reviewable Deliverable pursuant to Section 6(b) of this Schedule 9 within:

(i) subject to Section 6(a)(ii) of this Schedule 9:

(A) 15 Working Days following an initial submission of such Reviewable Deliverable; and

(B) 10 Working Days of any resubmission of such Reviewable Deliverable, provided that either the Department or the Enterprises, as applicable, may in its or their discretion (and by written notice to Developer) extend such period to 15 Working Days if it or they determine in its or their discretion that such longer review period is necessary; or

(ii) such other period as is otherwise expressly provided for such Reviewable Deliverable in this Agreement,

provided that any failure by the Department or the Enterprises, as applicable, to provide any written response within the applicable period determined in accordance with Sections 6(a)(i) and 6(a)(ii) of this Schedule 9:

(iii) to any Deliverable for Approval, shall be deemed a disapproval;

(iv) to any Deliverable for Acceptance, shall be deemed an Acceptance if Developer notifies the Department or the Enterprises, as applicable, of such failure and the Department or the Enterprises, as applicable, subsequently fail to respond in any way within five Working Days of receipt of such a notice; and

(v) to any Deliverable for Information, shall be deemed to have satisfied the condition specified in Section 3(a)(iii) of this Schedule 9.

(b) The Department or the Enterprises, as applicable, shall provide one of the following responses, in writing, to each Reviewable Deliverable:

(i) for Deliverables for Approval:

(A) unconditional Approval;

(B) conditional Approval, with guidance as to any conditions and/or comments that Developer must agree, in writing, to comply with and/or respond to as and when required by the terms of such conditional Approval in order for such conditional Approval to be effective (which compliance and/or responses may, in the Department's or the Enterprises' discretion, be permitted to occur after such conditional Approval becomes effective); or

(C) disapproval, with or without guidance as to the basis for the disapproval and/or whether either the Department or the Enterprises, as applicable, expects to subsequently Approve such Reviewable Deliverable following any resubmission subject to modifications and/or conditions (including any that are required to address comments made in the Department's or the Enterprises' response, as applicable);

(ii) for Deliverables for Acceptance:

(A) unconditional Acceptance;

(B) conditional Acceptance, with guidance as to any conditions and/or comments that Developer must agree, in writing, to comply with and/or respond to as and when required by the terms of such conditional Acceptance in order for such conditional Acceptance to be effective (which compliance and/or responses may, in the Department's or the Enterprises' discretion, be permitted to occur after such conditional Acceptance becomes effective); or

(C) rejection, with guidance as to the basis for the rejection and/or whether either the Department or the Enterprises, as applicable, expects to subsequently Accept such Reviewable Deliverable following any resubmission subject to modifications and/or conditions (including any that are required to address comments made in the Department's or the Enterprises' response, as applicable); or

(iii) for Deliverables for Information, comments or written confirmation of "no comments".

(c) Notwithstanding any Approval, Acceptance, comment or other response of or on a Reviewable Deliverable, Developer acknowledges and agrees that its ability to rely on the same is subject to Section 2.2.5 of the Project Agreement.

7. **Tracking of Deliverables**

(a) Prior to the issuance of NTP1, Developer shall submit to the Department for Acceptance, as part of its Project Management Plan delivered pursuant to Schedule 8 (*Project Administration*), the Deliverable Requirements Tracking List ("DRTL").

(b) The DRTL shall:

(i) identify each Reviewable Deliverable that, as of the date of submission of the DRTL, Developer knows or anticipates will need to be submitted to the Department or the Enterprises, as applicable;

(ii) specify the type of Reviewable Deliverable;

(iii) include Developer's proposed timeframe and sequence for submission, review and resolution of each Reviewable Deliverable; and

(iv) show how, given the proposed timing and sequencing of such Reviewable Deliverables, the Department or the Enterprises, as applicable, shall be able to reasonably review and respond to all such Reviewable Deliverables pursuant to Section 6 of this Schedule 9 while avoiding the concurrent review of five or more Reviewable Deliverables that require review by the same specialty experts (as reasonably determined by the Department or the Enterprises, as applicable) unless the Department has previously Approved such concurrent review.

(c) Following the Department's Acceptance of the DRTL, Developer shall use the DRTL to track the status of all Reviewable Deliverables, including all submissions and resubmissions and responses from the Department and the Enterprises, as applicable.

(d) Developer shall deliver to the Department for Acceptance monthly updates to the DRTL to track the status of all Reviewable Deliverables, including updates to the DRTL as may be necessary to reflect the inclusion of any Reviewable Deliverable that was not previously included in the DRTL.

8. **Sequencing**

(a) Developer shall use Reasonable Efforts to schedule, prioritize and coordinate all Reviewable Deliverables to allow an efficient and orderly Reviewable Deliverables review process pursuant to this Schedule 9 and the DRTL.

(b) To the extent that Developer exceeds any of the limits on Reviewable Deliverables set out in this Agreement or the DRTL, the Department or the Enterprises, as applicable, shall (acting reasonably and taking into account the number and nature of any other Reviewable Deliverables that it and/or they may concurrently be in the process of reviewing) determine a time period for the review of the Reviewable Deliverables that exceed such limit.

(c) For certainty, neither the Department nor the Enterprises shall be obligated to concurrently review five or more Reviewable Deliverables that require review by the same specialty experts (as reasonably determined by the Department or the Enterprises, as applicable) unless the Department or the Enterprises, as applicable, has or have previously Approved such concurrent review.

9. **Developer Responses**

Except with respect to:

(a) a Deliverable for Information; and

(b) any other Reviewable Deliverable that the Department or the Enterprises, as applicable, has or have:

(i) unconditionally Approved or unconditionally Accepted; or

(ii) notified Developer are not subject to Section 9(c) and/or Section 9(d) of this Schedule 9,

Developer shall:

(c) respond to all comments and responses from the Department or the Enterprises on or to any Reviewable Deliverable, including by making modifications to such Reviewable Deliverable as necessary to fully reflect and resolve all such comments and responses; and

(d) if and to the extent modifications to such Reviewable Deliverable are necessary pursuant to Section 9(c) of this Schedule 9, resubmit:

(i) any RFC Deliverable; and

(ii) any other Deliverable to the extent reasonably required by the Department or the Enterprises, as applicable,

as many times as is necessary until either the Department or the Enterprises, as applicable, has or have either:

(iii) unconditionally Approved or unconditionally Accepted the relevant Reviewable Deliverable; or

(iv) notified Developer that such RFC Deliverable or other Deliverable is no longer subject to resubmission pursuant to this Section 9(d) of this Schedule 9.

1. GENERAL

1.1 Purpose

1.1.1 The purpose of this Section is to summarize the Developer's obligations with respect to design and construction of the Project by identifying major elements of the Construction Work, including references to the processes and procedures that the Developer is required to comply with.

1.1.2 Reference is made to the Sections of this Schedule and other Schedules which include details of the specific requirements relevant to the Construction Work.

1.2 Application of Schedule 10 Design and Construction Requirements

1.2.1 Without limiting any other provision of this Project Agreement, this Schedule (including all of the terms, conditions, requirements, criteria, specifications and standards set out or referenced herein) comprises the minimum obligations of the Developer in respect of the matters set out in this Schedule, including in respect of the provision, performance and carrying out of the Construction Work.

1.2.2 The Developer shall ensure that the Construction Work complies with and is undertaken in accordance with the terms, conditions, requirements, criteria, specifications and standards set out or referenced in this Schedule.

1.2.3 In complying with the terms, conditions, requirements, criteria, specifications and standards set out or referenced in this Schedule, the Developer shall give due regard to the terms, conditions, requirements, criteria, specifications and standards set out or referenced in each of the other Sections of this Schedule and to the other provisions of the Project Agreement.

1.2.4 Nothing in any one Section of this Schedule shall relieve the Developer from its obligations to comply with the terms and conditions, requirements, criteria, specifications and standards set out or referenced in each of the other Sections of this Schedule.

1.2.5 The Developer shall design and construct all Elements of the Project in compliance with the requirements of all relevant Sections of the Project Agreement including all performance requirements and the Handback Requirements.

1.3 General Requirements

The Developer's obligations in respect of the Construction Work are summarized below and shall be carried out in accordance with the Project Agreement, the Sections of this Schedule and other Schedules:

a. Removal and replacement of the existing I-70 Mainline on viaduct from Brighton Boulevard to Colorado Boulevard, with the I-70 Mainline lowered below existing grade;

b. Construction of Cover over the I-70 Mainline (including Planning Area 1 and Planning Area 2) between Columbine Street and Clayton Street;

c. Reconstruction of the I-70 Mainline from Brighton Boulevard to Quebec Street;

d. Widening of the I-70 Mainline to include a Tolled Express Lane in each direction from Quebec Street to Chambers Road;

e. Restriping of the existing I-70 Mainline from east of I-25 to Brighton Boulevard;

f. Construction of cross streets at Brighton Boulevard, York Street, Josephine Street, Columbine Street, Clayton Street, Fillmore Street, Steele Street/Vasquez Boulevard, Cook Street, Monroe Street, Colorado Boulevard, Dahlia Street, Holly Street, Monaco Street, Quebec Street, and Peoria Street (reconstruction of the cross streets at Central Park Boulevard, Havana Street and Chambers Road is not included);

g. Combining existing ramps at Dahlia Street and Monaco Street into a single interchange at Holly Street;

h. Reconstruction of the UPRR Crossing, UPRR Pepsi Lead Crossing, UPRR York Street Crossing, BNSF Crossing, and DRIR Crossing;

i. Reconstruction of the I-270 eastbound bridge over I-70 Mainline;

j. Provision of ITS and ETC system infrastructure, including an Active Traffic Management system; and

k. Maintenance of traffic including maintenance of existing roadways, including detours, during the Construction Period.

1.4 Notices to Proceed (Schedule 3)

Parts 1 and 2 of Schedule 3 Commencement and Completion Mechanics shall apply in respect of the commencement of the Construction Work.

1.5 Project Administration (Schedule 8)

The Developer shall comply with its obligations under Schedule 8 Project Administration and undertake all actions as necessary when discharging its obligations relating to project management and Quality Assurance Activities for the Construction Work.

1.6 Submittals (Schedule 9)

The Developer shall comply with the procedures set out in Schedule 9 Submittals when making submittals to the Department, the Enterprises or any other Person in connection with the Construction Work.

1.7 Approvals, Consents and Permits

Except to the extent expressly provided otherwise in the Project Agreement, the Developer shall be responsible for obtaining all Governmental Approvals and Permits in connection with the Construction Work.

1.8 Detailed Requirements

Detailed requirements for individual Construction Work elements are described in the remaining Sections of this Schedule listed below:

a. Section 2: Maintenance of Traffic;

b. Section 3: ITS and Tolling Equipment;

c. Section 4: Utilities;

d. Section 5: Survey;

e. Section 6: Roadway Pavements;

f. Section 7: Earthwork;

g. Section 8: Drainage;

h. Section 9: Roadway;

i. Section 10: Railroads;

j. Section 11: Signing, Pavement Markings, Signalization and Lighting;

k. Section 12: Cover MEP System;

l. Section 13: Structures; and

m. Section 14: Landscaping and Aesthetics.

1.9 Applicable Standards and Specifications (Schedule 10A)

1.9.1 Except to the extent expressly provided otherwise in the Project Agreement, the Developer shall design and construct the Project in accordance with the Construction Standards. The list of standards in Schedule 10A Applicable Standards and Specifications shall not be considered comprehensive.

1.9.2 The I-70 Mainline and CDOT Roadways and associated Construction Work shall be designed and constructed in accordance with the CDOT *Standards and Specifications* (as modified by Appendix A to Schedule 10A Applicable Standards and Specifications).

1.9.3 Local Agency Roadways and associated Construction Work shall be designed and constructed in accordance with the standards and specifications of the Local Agency (e.g., City of Denver).

1.10 Contract Drawings (Schedule 10B)

Schedule 10B Contract Drawings contains the Contract Drawings in accordance with which the Developer shall develop the design and construct the Project.

1.11 Reference Documents (Schedule 29)

Section 3 of the Project Agreement sets out the status of the Reference Documents in relation to the performance of the Work, including the Construction Work.

1.12 Strategic Communications (Schedule 14)

The Developer shall comply with its obligations under Schedule 14 Strategic Communications when discharging its obligations relating to Construction Work.

1.13 Federal and State Requirements (Schedule 15)

The Developer shall comply with its obligations under Schedule 15 Federal and State Requirements when discharging its obligations relating to Construction Work.

1.14 Environmental Requirements (Schedule 17)

Except to the extent expressly provided otherwise in the Project Agreement, the Construction Work required to be carried out by the Developer:

a. Shall include all Elements and commitments described in the I-70 East EIS to the extent that such Elements and commitments relate to the scope of the Project;

b. Shall be compatible with the I-70 East EIS to ensure implementation of the Ultimate configuration to the extent that it relates to the scope of the Project; and

c. Shall include all mitigation measures required to be carried out to ensure compliance with the I-70 East EIS, as required by Schedule 17 Environmental Requirements.

1.15 Right-of-Way (Schedule 18)

Right-of-Way defines a major constraint to the Developer's design in terms of boundary restrictions and limits of the Construction Work. Except to the extent expressly provided otherwise in the Project Agreement, the obligations and responsibilities of the Department and the Developer are set out in Schedule 18 Right-of-Way and the Parties shall comply with these accordingly.

1.16 Havana Street Design-Build Project

A separate improvement project, the Havana Street Design-Build Project, involves construction of the I-70 Mainline to the Ultimate configuration. The improvements are planned to be completed prior to issuance of NTP 2. The Developer's Construction Work within the physical limits of the Havana Street Design-Build Project shall include any striping, signing or other modifications required to accommodate the Construction Work.

1.17 City of Denver Identified Future Improvements and Non-Preclusion Areas

1.17.1 The Developer's design and construction shall not preclude CCD identified improvements specified in Sections 1.17.1.a to c below.

a. Construction of a future second cover over the I-70 Mainline from 50 feet west of the Steele Street/Vasquez Boulevard Bridge to 50 feet east of the Cook Street Bridge;

b. Conversion of York Street to two-way operations; and

c. Conversion of Josephine Street vehicular bridge over the I-70 Mainline to a pedestrian crossing.

1.17.2 The Developer shall not construct permanent improvements within the non-preclusion areas identified in the Reference Documents and specified in Sections 1.17.2.a to f below. Only staging and/or temporary construction is allowed within these areas.

a. Construction of a pedestrian overpass over the UPRR Crossing along 47th Avenue as depicted on the graphic in the Reference Documents;

b. Construction of a Xcel gas regulator station within Parcel AP-169 as depicted in the Reference Documents;

c. Construction of planned improvements shown on the National Western Stock Show Non-Preclusion Area 1 Exhibit in the Reference Documents;

d. Construction of planned improvements shown on the National Western Stock Show Non-Preclusion Area 2 Exhibit in the Reference Documents;

e. Construction of planned improvements shown on the Steele-Vasquez Southern Quadrants Non-Preclusion Exhibit in the Reference Documents; and

f. Construction of planned improvements shown on the Steele St to Colorado Blvd (North) Non-Preclusion Exhibit in the Reference Documents.

1.17.3 The Developer's design and construction shall accommodate the CCD identified improvements specified in Sections 1.17.3.a to b below without requiring future reconstruction of the Work.

a. Widening of Quebec Street by one additional lane northbound and southbound with sidewalks for pedestrian/bicycle facilities in accordance with the Roadway Typical Sections provided in Schedule 10B Contract Drawings; and

b. Widening of Peoria Street by one additional lane northbound and southbound, with sidewalks for pedestrian/bicycle facilities in accordance with the Roadway Typical Sections provided in Schedule 10B Contract Drawings.

1.18 Compatibility with the I-70 Ultimate Configuration (Sand Creek to Tower Road)

The Developer's design and construction between Sand Creek and Chamber Road shall account for the future I-70 Ultimate configuration. The Construction Work in such location shall not preclude the future implementation of the I-70 Ultimate configuration, provided that storm water ponds shall be designed and constructed to meet the construction requirements set out in this Schedule 10.

2. MAINTENANCE OF TRAFFIC

2.1. General

The Developer shall be responsible for designing, providing and maintaining safe and effective traffic control on all roadways that are affected by the Construction Work for the movement of people, goods, and services through and around the Project while minimizing impacts to local residents, businesses and commuters.

2.2. Transportation Management Plan

2.2.1. The Developer shall prepare a Transportation Management Plan (TMP) including Temporary Traffic Control Plan (TCP) Strategies, a Transportation Operations (TOP) Strategies, and Public Information (PI) Strategies for all proposed Work associated with the Project during the Construction Period, which is consistent with and expands upon the draft TMP submitted with the Proposal. Responsibilities include monitoring and updating the TMP throughout the Construction Period. The TMP shall document how traffic shall be managed during the construction of the Project. The TMP shall follow the requirements shown in CDOT's *Work Zone Safety and Mobility Rule Procedures Document*.

2.2.2. Submission by the Developer, and Approval by the Department, of the TMP shall be prior to the issuance of NTP2. Subsequent modifications to the TMP shall be submitted to the Department for Approval.

2.2.3. Transportation Management Plan Content

The Developer shall prepare a TMP that defines the strategic plan for traffic management on the Project. The TMP shall address major aspects of the Construction Work for individual construction areas, phases, and stages. The Developer shall involve all affected agencies in the development of the TMP and associated plans. The TMP shall be used as a planning and policy guide to develop and execute the Maintenance of Traffic (MOT) program for the Project. The TMP's contents shall include or address at a minimum (1) the following matters as described in Sections 2.2.3.a to h of this Schedule 10 and (2) the matters as described in Sections 2.2.4 to 2.2.6 of this Schedule 10:

a. An overview and description of the Project, subdivided as applicable, into the following components:

   i. Area: A specific grouping of Construction Work for the Project, defined by the Developer, which creates segments of the Project for the purpose of planning and executing the Construction Work;

   ii. Phase: A specific sequence of the Construction Work in an area during which a major traffic movement is undertaken (e.g., a detour) and left in place until the Construction Work is complete and traffic is redirected to another location. This shall require development of a specific TCP. In some cases, multiple TCPs may be necessary; and

   iii. Stage: A subdivision of Construction Work within a phase that combines similar components of Construction Work to maintain efficiency.

b. Provide information on existing and future conditions including traffic, safety, lighting, and business/community access.

c. A list of known or potential roadway, ramp, and lane Closures, including the following information:

   i. Description of traffic shift;

   ii. Description of detour:

      A. Identification of detour limits to be used in each construction phase; and

B. The Developer's identification and coordination with other construction projects, within the vicinity of the proposed detour route. The impact of these construction projects shall be incorporated into the detour route planning and scheduling.

iii. Number of shifts expected; and

iv. Duration of shifts and detours.

d. A description of proposed detour routes;

e. Typical section requirements;

i. Lane widths;

ii. Shoulder widths;

iii. Number of lanes;

iv. Barrier/wall locations; and

v. Proposed work zone locations.

f. Emergency requirements:

i. Pull-out locations;

ii. Emergency access; and

iii. Courtesy patrol.

g. Temporary Closure scenarios:

i. Location; and

ii. Time and duration.

h. Access:

i. Pedestrian/bike;

ii. Business;

iii. Local/adjacent property owner access;

iv. Project; and

v. Bus/transit.

2.2.4. Temporary Traffic Control Plan Strategies

a. The Developer shall provide a detailed approach to the development of TCPs, including Temporary Drainage as described in Schedule 10, Section 8 Drainage, and Methods of Handling Traffic (MHT) on the Project.

b. The Developer shall provide a detailed approach to the implementation and monitoring of TCPs and Methods of Handling Traffic (MHT) on the Project. At a minimum, the Developer shall include the following:

i. Process for Developer MOT inspections (daytime and nighttime).

ii. Process for opening new MOT phases or stages to traffic (safe-to-open procedure).

iii. Process for opening new MOT phases or stages to traffic on Local Agency Roadways (see Reference Documents for more information on CCD requirements).

iv. Process for winter maintenance of MOT devices and temporary striping.

v. Process for monitoring the safety and effectiveness of TCPs and MHTs.

vi. Process for refining unsafe or ineffective TCPs and MHTs.

c. Business and Private Access

The Developer shall maintain public and private access to the local street system. See additional requirements under the Maintenance of Access Plan included in Section 2.9 to this Schedule 10. TCPs and MHTs shall incorporate stakeholder information from the PI, available surveys, and other pertinent studies relating to business and private access to the local street system and the highway facilities. At a minimum, the Developer shall communicate and document the following information relevant to business and private access:

i. Access points impacted by a particular construction phase or stage;

ii. All notifications of affected businesses and land owners;

iii. Schedule of Closures and estimated durations;

iv. Project-specific access or delivery requirements for local businesses (deliveries, wide load vehicles, etc.); and

v. Proposed mitigation efforts.

d. Colorado Transportation Management Center Coordination

i. The Developer shall provide an approach to the use of Intelligent Transportation System (ITS)/Variable Message Sign (VMS) boards and traffic signals/ramp meter stations, including coordination with the Denver Traffic Management Center, and Colorado Transportation Management Center (CTMC);

ii. Routine requests for use of the CTMC VMS boards shall be submitted to the Department by 10:30 a.m. on Thursday of the week prior to when the VMS boards will be needed (Monday through Sunday of the following week). Requests for routine use of the VMS will be reviewed by noon Friday of the same week of the submittal. The Developer shall coordinate directly with the CTMC at 303-512-5830 following review by the Department;

iii. For after-hours (non-construction work times) operations only, the Developer shall coordinate directly with the CTMC. The CTMC is available to the Developer to modify VMS messages 24 hours a day, seven days a week; and

iv. The Developer shall coordinate with the Colorado Department of Transportation (CDOT), City of Denver (CCD), and the CTMC in relation to Emergencies, in accordance with the Accepted Incident Management Plan (IMP).

2.2.5. Transportation Operations Strategies

The Developer shall:

a. Provide a detailed approach to Travel Demand Management (TDM) strategies.

b. Inventory existing bus and rail routes/stops and provide an approach to coordination with Regional Transportation District (RTD) to resolve disruptions in services due to the Construction Work.

c. Provide an approach to traffic access management, including restrictions, bicycles, pedestrians, and potential impacts to handicapped mobility.

d. Provide an approach to coordinate with Denver International Airport during peak travel times.

e. Provide an approach to pedestrian and bicycle movements associated with all school routes within the Site, including to/from Swansea Elementary, Bruce Randolph Junior

High and Garden Place Elementary Schools. The approach shall include handicap accessibility, bus and shuttle parking and access, parent drop-off and pick-up circulation and location, lighting, before and after school activities. The Developer's strategy shall include signing, pavement marking, and pedestrian signalization in compliance with MUTCD and CCD standards. The Developer's strategies shall be coordinated with the respective school and Denver Public Schools Department of Transportation. The Developer shall coordinate with the CCD Safe Route to School coordinator for current student distribution maps and overall pedestrian walk path ratings can be found at www.walkscope.org.

f. The approach and strategies to be implemented for pedestrian and bicycle movements associated with the UPRR York Street Crossing shall specifically address safety and delays caused by UPRR train movements. The Developer's strategies shall consider flagging and shuttles during periods of start and end to the school day to safely move pedestrians and bicycles. The Developer shall also provide a covered and secured pedestrian access under the UPRR shoofly during the Construction Period.

g. Develop a detailed IMP to manage traffic incidents and emergency operations on the Project. The IMP shall comply with the CDOT *Guidelines for Developing Traffic Incident Management Plans for Work Zones*. The IMP shall be submitted to the Department for Acceptance within 30 Calendar Days after the issuance of NTP1. At a minimum, the IMP shall include the following:

i. Coordination with the PIP;

ii. Incident detection and identification;

iii. Incident response;

iv. Incident site management;

v. Incident clearance;

vi. Dissemination of traveler information regarding incidents;

vii. Courtesy patrol;

viii. Emergency Services notification, including local area police departments, the Colorado State Patrol (CSP), local area fire departments, ambulance services, and any other Emergency response providers;

ix. Notification of local school districts about possible impacts to school bus routes, student drop-offs, and/or pedestrian facilities;

x. Geographic and other special constraints;

xi. Available resources; and

xii. Operational procedures.

xiii. Detour routes to be used in the event of a catastrophic incident along I-70 Mainline or ramps that would require a Closure that is not permitted by any of Sections 2.11.6, 2.11.9, or 2.11.10. The Developer shall coordinate with any impacted Local Agencies if detour routes use Local Agency Roadways. Developer shall ensure that the detour routes work for each traffic phase and stage throughout construction.

h. Coordinate and work cooperatively with the corridor-focused Transportation Management Organization (TMO) and the Department. Additionally, the Developer shall provide:

i. Four VMS boards used exclusively for TDM outreach; and

ii. A grant program to be implemented, in cooperation with the Department, during the first three years of the Operating Period. The grant program shall be funded by the Developer and have a total amount of no less than The program shall support community-based projects that reduce Vehicle Miles Travelled and encourage multi-modal options within the Project area. Such projects may include support for bus stops, sidewalks, bike lanes, and crossing guards at key pedestrian crossing locations. The Developer shall administer an annual competitive grant application program, open to all nonprofit groups, registered neighborhood organizations, and schools located within the Project area, to award the grant funds. Individual grants may be awarded in reasonable amounts to be determined by the Developer.

i. Cooperate with the Department with regards to any dynamic ride sharing programs established in the metro area.

2.2.6. Public Information Strategies

a. Provide a detailed approach to coordinate the TMP Activities with performance of the Developer's obligations under Schedule 14 Strategic Communications;

b. A checklist identifying specific items shall be provided to the Department by the Developer's Project Communications Manager;

c. The Developer's Project Communications Manager and the Department's Communications Manager shall meet once per week to discuss public information and management Activities on the Project. The checklist shall provide the inclusion of supporting information relevant to coping messages and public awareness and shall be included in the Construction Period Communications Plan (CPCP), as described in Schedule 14 Strategic Communications;

d. The Developer shall establish a MOT Task Force to ensure proper coordination with affected agencies. The MOT Task Force shall include, at a minimum, the Developer's Project Communications Manager, Traffic Control Supervisor, Superintendent, the Department, RTD, Denver Police Department-Traffic Unit, and Local Agencies (e.g., CCD, Commerce City, Adams County, and City of Aurora). The Developer shall submit the proposed list of the MOT Task Force members to the Department for Acceptance within 30 Calendar Days after issuance of NTP1. Within 14 Calendar Days after Acceptance of the proposed list of MOT Task Force members, the Developer shall convene a TMP kick-off meeting. The meeting will be used to develop agreement upon the level of detail required for the TMP; and

e. The MOT Task Force shall meet weekly, and shall be an integrated component of the CPCP, as described in Schedule 14 Strategic Communications. The Developer is responsible for the preparation and distribution of agendas, meeting materials, and meeting minutes and shall submit the minutes to the Department for Acceptance in accordance with Section 9 of Schedule 8 Project Administration.

2.3. Maintenance of Traffic Variance Process

2.3.1. The Developer shall adhere to the requirements for lane Closures, detours and any other restrictions as set forth within this Section 2, except the Developer may request an MOT Variance from the Department or, as the case may be, the relevant Local Agency to reduce neighborhood/business impacts, improve safety, or improve quality.

2.3.2. In relation to MOT Variances required from the Department, if the Developer can show some benefit in the areas referred to in Section 2.3.1, and present it successfully to the Department, then the Developer may be granted an MOT Variance. The following information shall be included in each MOT Variance request submitted to the Department:

a. Summary of the MOT Variance request;

b. Justification for the MOT Variance request, including a list of the criteria that cannot be met and the reasons for not being able to meet the criteria;

c. Hour-by-hour schedule of planned work activities during the variance;

d. Public notification methods and schedule;

e. List of affected Emergency Services and the schedule for notification;

f. List of affected Local Agencies or private owners and the method(s) and schedule for notification;

g. Description of additional public information surveys to be performed, if required;

h. List of any potential safety hazards to which the public may be exposed;

i. Proposed revisions to the Accepted TCP or current MHT; and

j. Proposed duration of lane Closure, detour, or phasing change for which a MOT Variance is requested.

The Developer shall submit any MOT Variance request to the Department for Approval 30 Calendar Days prior to implementation.

2.3.3. In relation to MOT Variances required from a Local Agency, the Developer shall comply with all Local Agency requirements, including submittal contents and time periods, relating thereto. In addition, the Developer shall meet all Local Agency requirements for detours utilizing non-State owned facilities. Promptly after receipt of the relevant approval, the Developer shall submit a copy of any approved MOT Variance granted by a Local Agency to the Department for Information.

2.4. Developer Response Time

The Developer shall have at least one employee on call at all times, via cellular phone, that can be a point of contact for immediate response to an incident (i.e. within 30 minutes or less after notification). Upon arrival at the incident, Developer shall assess the situation and immediately notify the appropriate personnel to implement the IMP. Upon notification of the incident, the Developer shall cooperate with the Emergency Services and immediately undertake actions necessary to restore traffic operations, as described in the IMP, in a timely and expedient manner.

2.5. Special Events

2.5.1. Within 15 Working Days after the issuance of NTP 2 and prior to the commencement of each Contract Year thereafter, and additionally when requested by the Department, the Developer shall coordinate with the Department's Communications Manager and the Local Agencies to develop a list and schedule of Special Events for a period as may be agreed to by the Developer and the Department. The special event calendar shall be a standing agenda item at the weekly MOT Task Force meetings and specific event mitigation measures will be agreed to by the MOT Task Force members.

2.5.2. The Developer shall coordinate with the CCD and other Local Agencies to develop mitigation that the Construction Work creates regarding delays before, during and after Special Events. This shall include and will not be limited to events such as dignitary escorts, sporting facilities, the National Western Stock Show, local events, etc.

2.5.3. To accommodate traffic to and from Special Events, the Developer shall implement necessary changes in Construction Work Activities as a result of specific event mitigation measures agreed to by the MOT Task Force. No additional lane Closures that could affect traffic movements associated with the Special Event shall be permitted on the day of any Special Event, unless Approved by the Department 14 Calendar Days prior to implementation. The Developer shall use reasonable efforts to mitigate the effects of ongoing lane Closures on traffic movements associated with Special Events. Construction Work outside the travel lanes, ramps and shoulders shall be permitted during Special Events unless specifically prohibited otherwise in this Section 2.

2.6. National Western Stock Show

To accommodate traffic to and from the National Western Stock Show, the Developer shall implement necessary changes in Construction Work Activities as a result of specific event mitigation measures agreed to by the MOT Task Force. Further, no Construction Work (whether inside or outside of travel lanes, ramps, and shoulder) is permitted at the Brighton Boulevard Interchange, associated ramps, Brighton Boulevard, and 47th Avenue west of Williams Street from the Saturday prior to the start, until the Sunday following the end, of the National Western Stock Show. Additionally, no full ramp Closures of the Brighton Boulevard WB exit ramp are permitted during these periods.

2.7. RTD Transit System

2.7.1. The Developer shall coordinate with RTD to minimize any impacts to the RTD transit system as a result of the Construction Work, including bus routes, station access, bus stop locations, and other RTD services. During the Construction Period the Developer shall coordinate with RTD prior to disruptions to RTD service areas and schedules. Coordination with RTD shall be done far enough in advance to allow 30 Calendar Days' notification to transit users of any closures, delays, or modifications in bus or rail routes; and of modifications or relocation of transit stops or signage along the affected routes. The Developer shall utilize the appropriate Strategic Communications Plan(s) (Schedule 14 Strategic Communications) to communicate changes of RTD service to RTD patrons and the public.

2.7.2. The Developer shall maintain access to all RTD stations within the Project during construction. Any modifications to RTD station access or bus stop locations shall be submitted to the RTD for approval and copied to the Department, for Information.

2.7.3. The Developer shall include CCD in all coordination with RTD.

2.8. Coordination with Adjacent Projects

The Developer shall coordinate with the Department, RTD, Local Agencies, and adjacent projects to coordinate construction traffic and detour impacts and minimize simultaneous lane Closures or impacts to adjacent or alternate routes.

2.9. Maintenance of Access Plan

The Developer shall maintain business accesses at all times unless otherwise Approved by the Department. For businesses with multiple driveways, when driveway Closure is necessary to progress Construction Work, no driveway may be closed for more than 30 consecutive Calendar Days or more than 45 Calendar Days in aggregate. The grades for temporary driveways shall not be greater than the existing driveway grade. The Developer shall work with the property owner to coordinate access restrictions during that particular construction phase.

2.10. Maintenance of Traffic Analysis and Operations

2.10.1. The Developer shall evaluate intersection traffic operations in advance of all major MOT phases. Major phases will be identified at the discretion of the Department, and will generally be indicated by major changes in Construction Work locations and lane Closures. The purpose of the evaluation is to ensure that any traffic operations impacts related to the MOT Plans are acceptable to the Department and the Local Agencies. The Developer shall use existing traffic data supplied by the Department, supplemented by additional traffic counts by the Developer as required. The Developer shall report any increases in intersection delay or queue length. The Developer shall use the traffic modeling software provided in the Reference Documents to project the expected queue lengths and delays. The Developer shall provide intersection analysis that includes traffic signal timing optimization and signal coordination along signalized corridors. Timing plans and implementing timing plans shall be coordinated with CCD.

2.10.2. The Department will not use specific delay or queue length thresholds for evaluation, but traffic operations will be evaluated while considering the Developer's overall MOT Plans and approach. The Developer shall be responsible for monitoring actual queues and delays during MOT operations, evaluated on a rolling 2 week average. If the queues and delays exceed the predicted

value, then it shall be the Developer's responsibility to modify the TCPs within 24 hours to mitigate impacts to traffic operations. All proposed changes to the TCPs shall be submitted to the Department for Acceptance.

2.10.3. The Developer shall submit the MOT operations and analysis to the Department for Acceptance. The traffic analysis shall be summarized in report format, and include all supporting documentation.

2.10.4. The Department may identify that additional analysis is necessary if the traffic impacts are unacceptable to the Department. If so, the Developer shall be required to prepare an analysis of the Construction Work Activities that includes the following:

a. Project Location and Description:

i. Location and Construction Work required;

ii. Existing condition;

iii. Purpose for the threshold exception request, along with how long and what hours the lane Closures will be in effect; and

iv. Recommendations to minimize impacts.

b. MOT Alternatives

i. All potential options for MOT with descriptions and discussions of each, including the following:

ii. Advantages/disadvantages;

iii. Estimated timeframe;

iv. Potential economic impact to communities and businesses; and

v. Ability to gain public buy-in and awareness of the impacts and means to mitigate those impacts.

c. Traffic Analysis

i. Queue/delay analysis;

ii. Percent diversion that is reasonable to expect given the location and construction Activity; and

iii. Resulting traffic operations after diverting.

d. Detour Calculations

i. If a detour is proposed, provide detour route description, detour map(s), and user cost created to travel the extra distance;

ii. Provide capacity, volume, and queue length calculations for the critical node along the detour route; and

iii. Suggest improvements to the detour route to improve traffic flow on the route with the detour traffic.

e. Summary and Recommendations

i. List alternatives in order of preference and explain why the alternative is or is not preferred; and

ii. Summarize alternatives in table format, including important comparison items such as maximum queue lengths; the number and width of open lanes; the length, dates, and duration of construction period for the relevant part of the Construction Work.

2.11. Design Requirements

2.11.1. Temporary Traffic Control Plan (TCP)

a. The Developer shall prepare a TCP to control traffic on the Project. The TCP shall conform to the requirements specified herein and the CDOT *Standard Specifications*. The TCP shall generally include all lane and shoulder configurations, including widths, traffic control signing, pavement markings, traffic control devices, temporary signalization, construction access, construction parking, emergency access, work areas, lighting, and pedestrian/bicycle movements necessary for each construction phase. Temporary traffic signals shall be installed as described in Schedule 10, Section 11 Signing, Pavement Marking, Signalization, and Lighting;

b. The TCP shall be submitted to the Department for Acceptance; and

c. Any major revision to the TCP, as determined by the Department, shall require submission of a new TCP for Acceptance.

2.11.2. Method of Handling Traffic (MHT)

To implement the TCP, the Developer shall prepare MHTs that conform to the requirements specified herein and the CDOT *Standard Specifications*. The MHTs shall be submitted to the Department for Acceptance.

2.11.3. Detour Design

a. Detour designs shall move traffic to equivalent classification roadways or roadways with greater capacity, or as otherwise Approved by the Department.

b. Detour design shall be as described in Table 2-1.

Table 2-1 Design and Posted Speeds for Construction Work Zones

Location	Design Speed (mph)	Posted Speed (mph)
I-70 Mainline, I-225 and I-270	55	55
Ramps and collector-distributor roads	As posted under existing conditions	As posted under existing conditions
CDOT Roadways (other than I-225 and I-270) and Local Agency Roadways	As posted under existing conditions	As posted under existing conditions

2.11.4. The Developer's Professional Engineer in responsible charge of the MOT design shall prepare or oversee, review, seal with a Colorado PE stamp and approve: field design changes that require a revision to a previously stamped and approved plan sheet; Release for Construction Documents; and TCP plans.

2.11.5. Full Local Agency Roadway Closure Restrictions

Local Agency Roadways will be affected by the reconstruction of I-70 Mainline between Brighton Boulevard and Quebec Street requiring restrictions regarding concurrent Construction Work Activities as follows:

a. North and South Connectivity and Roadway Restrictions

i. Maintaining access to the Elyria and Swansea Neighborhoods and reducing out of direction travel is critical. The businesses, schools and social gathering spots in these communities depend on the crossings to traverse the neighborhood, and provide as little disruption to their livelihood as possible. Construction phasing shall be taken into account in the determination and implementation of

construction phasing and detours. All directions of travel during construction phasing shall be considered in the roadway network to maintain current circulation and prevent the isolation of communities, especially north and south of the I-70 Mainline.

ii. Full roadway closures of Brighton Boulevard, Steele Street, Vasquez Boulevard, Colorado Boulevard, Quebec Street, and Peoria Street are not allowed except as permitted by Section 2.11.5.a.iii and iv. At a minimum, the Developer is required to maintain the same number of thru lanes and left turn lanes as are provided in the existing conditions unless alternative measures are used to mitigate the loss of existing conditions. Reducing the number of thru lanes and auxiliary turn lanes will need to be Approved by the Department through the MOT Variance process described in Section 2.3 (whether an MOT Variance is required from the Department or a Local Agency).

iii. Full night Closures of Brighton Boulevard, Steele Street, Vasquez Boulevard, Colorado Boulevard, Quebec Street, and Peoria Street are permitted during the Construction Period only between 10:00 PM and 5:00 AM (other than on a Holiday), provided that:

A. a maximum of six such Closures in relation to each such roadway is permitted during the whole of the Construction Period; and

B. the implementation of any such Closure is subject to prior Acceptance by the Department.

The Developer shall prepare the TMP, TCPs, Project Schedule, and perform Construction Work in accordance with the permitted construction Closures defined in this Section 2.11.6.

iv. Roadway Closures for north-south facilities shall be in accordance with Table 2-2. The Construction Work restrictions, as shown in the table, show where concurrent Closures are not permitted.

Table 2-2 Concurrent Full Roadway Closure Restrictions for North-South Facilities

	Roadway Closures Not Permitted								
	UPRR Crossing	York Street	Josephine Street	Columbine Street	Clayton Street	Fillmore Street	Dahlia Street	Holly Street	Monaco Street
York Street		-	X	X					
Josephine Street		X	-	X					
Columbine Street		X	X	-	X				
Clayton Street				X	-	X			
Fillmore Street					X	-			
Dahlia Street							-	X	
Holly Street							X	-	X
Monaco Street								X	-

X means concurrent full roadway Closures are not permitted

b. For certainty, for purposes of the definition of Construction Closure Deduction, paragraph b. of such definition in Part A of Annex A (*Definitions and Abbreviations*) to the Project Agreement shall apply to any full roadway Closure not permitted by Table 2-2.

c. East and West Connectivity and Roadway Restrictions

i. Full Closure of 46th Avenue between Brighton Boulevard and York Street is allowed upon initiation of UPRR Bridge Construction Work that necessitates full Closure.

ii. 46th Avenue, between York Street and Colorado Boulevard, shall maintain a minimum of one lane in each direction.

iii. Provide a temporary connection of 46th Avenue between Clayton Street and Columbine Street for the removal of the existing viaduct and construction of two-way 46th Avenue. After the 46th Avenue South connection between Clayton Street and Columbine Street is open for bi-directional travel, the temporary connection can be removed.

iv. 46th Avenue, between Steele/Vasquez and Monroe Street, shall maintain a minimum of one lane in each direction, for access to businesses south and north of I-70 between BNSF Market Lead Crossing and Colorado Boulevard. A temporary detour of 46th Avenue using Jackson Street, 48th Avenue, Vasquez Boulevard, and Colorado Boulevard is allowed with business access agreements in place, as needed, for the Construction Work.

v. Stapleton Drive, between Colorado Boulevard and Oneida Street, shall maintain a minimum of one lane in each direction, for access to businesses.

vi. In single lane situations, a minimum clear travel lane width shall be 16 feet.

2.11.6. Permitted I-70 Mainline and Ramp Full Closures

Subject to Acceptance by the Department, full Closures can be implemented by the Developer for the I-70 Mainline and ramps as outlined below during the Construction Period only. The Developer shall prepare the TMP, TCPs, Project Schedule, and perform Construction Work in accordance with the permitted construction Closures defined in this Section 2.11.6.

a. Permitted I-70 Mainline Full Closures

i. Night full Closures on the I-70 Mainline (Brighton Blvd. to I-270) – between 10:00 PM to 5:00 AM (other than at a Weekend or on a Holiday), up to ten occurrences are permitted during the whole of the Construction Period.

ii. Weekend full Closures on the I-70 Mainline (Brighton Blvd. to I-270) - 10:00 PM Friday to 5:00 AM Monday (other than on a Holiday), up to four occurrences are permitted during the whole of the Construction Period.

b. Ramp Full Closures

i. Permitted ramp full Closures on the I-70 Mainline can be implemented by the Developer in accordance with Table 2-3, subject to the sequencing restrictions listed in Section 2.11.6.b.v.

ii. Ramp full Closures at the Brighton Blvd. interchange are not permitted during the National Western Stock Show.

iii. The ramps that are located between Brighton Blvd. and I-270 are allowed to be closed during permitted full Closures of I-70 Mainline.

iv. Full ramp Closures are not permitted without Department Approval and Developer implementing a detour design for the Closure.

Table 2-3 Permitted Full Ramp Closures on the I-70 Mainline from Brighton Blvd. to Chambers Blvd.

Location	Ramp	Allowed Closure
Brighton Blvd. Interchange	EB exit ramp	No full Closures allowed
	WB entrance ramp	No full Closures allowed
	WB exit ramp	Full Closure allowed for up to the lesser of the period of construction and six months upon initiation of construction that affects ramp
	EB entrance ramp	No full Closures allowed
York Street	EB exit ramp	Full Closure allowed upon initiation of Viaduct removal that affects ramp
	WB entrance ramp	Full Closure allowed upon initiation of construction that affects ramp for UPRR phasing
Steele/Vasquez Blvd. Interchange	EB exit ramp	Full Closure allowed for up to the lesser of the period of construction and six months upon initiation of viaduct removal that affects ramp
	WB entrance ramp	Full Closure allowed for up to the lesser of the period of construction and six months upon initiation of viaduct removal that affects ramp
	WB exit ramp	Full Closure allowed upon opening of the Colorado Boulevard westbound exit ramp and 46th Avenue north between Vasquez and Colorado Blvd's. (Ultimate construction or temporary detour)
	EB entrance ramp	Full Closure allowed upon initiation of Viaduct removal that affects ramp
Colorado Blvd. Interchange	EB exit ramp	No full Closures allowed
	WB entrance (loop ramp from northbound Colorado Blvd.)	Full Closure allowed upon initiation of construction that affects ramp
	WB exit ramp	Full Closure allowed for up to the lesser of the period of construction and six months upon initiation of construction that affects ramp
	EB entrance ramp	No full Closures allowed
	EB entrance (loop ramp from southbound Colorado Blvd.)	Full Closure allowed upon initiation of construction that affects ramp

Location	Ramp	Allowed Closure
I-70 Slip Ramps to Stapleton Drive	EB exit @ Dahlia	Full Closure allowed upon initiation of construction that affects ramp
	WB entrance @ Dahlia	Full Closure allowed upon initiation of construction that affects ramp
	WB exit@ Monaco	Full Closure allowed upon initiation of construction that affects ramp
	EB entrance @ Quebec	Full Closure allowed upon initiation of construction that affects ramp
Quebec Street Interchange	EB exit ramp	Full Closure allowed for up to the lesser of the period of construction and six months upon initiation of construction that affects ramp
	WB entrance ramp	Full Closure allowed for up to the lesser of the period of construction and six months upon initiation of construction that affects ramp
	WB exit ramp	No full Closures allowed
	EB entrance ramp	No full Closures allowed
Central Park Blvd. Interchange	All existing ramps	No full Closures allowed
Havana Street Interchange	All existing ramps	No full Closures allowed
Peoria Street Interchange	All existing ramps	No full Closures allowed
Chamber Blvd. Interchange	All existing ramps	No full Closures allowed

v. Ramp Full Closure Sequencing

Prior to the Developer implementing a permitted ramp full Closure on the I-70 Mainline the following sequencing requirements associated with implementing the permitted ramp full Closures shall be met.

A. Steele/Vasquez interchange

Full Closures of Like Ramps (meaning any entrance ramps that provide the same directional access onto I-70 Mainline or any exit ramps that provide egress in the same direction from I-70 Mainline) at the Brighton Blvd. interchange and Colorado Blvd. interchange shall not occur concurrently.

B. Colorado Blvd. interchange

(I) Full Closures of Like Ramps (as defined in A. above) at the Steele/Vasquez Blvd. interchange shall not occur concurrently.

(II) The new Holly Street interchange shall be constructed and operational prior to Closure of ramps at the Colorado Blvd. interchange.

(III) Department Approval of detour route and design.

C. I-70 Slip Ramps to Stapleton Drive

The new I-70/Holly Street interchange shall be constructed and operational prior to Closure of I-70 slip ramps to Stapleton Drive interchange.

D. Quebec Street interchange

The new Holly Street interchange shall be constructed and operational prior to Closure of ramps at the Quebec Street interchange.

c. Request for full construction Closures

The Developer shall submit a lane Closure request for every permitted full Closure of the I-70 Mainline or ramps on the I-70 Mainline for Acceptance. Each lane Closure request shall include the following:

i. Detailed description of the permitted full Closure, need and type of Closure;

ii. Construction activities that will occur, and date, timing and duration of requested Closure;

iii. Detours for full permitted Closures; and

iv. Description of the coordination and relationship between the requested permitted Closure and:

A. Any other Closures that will be in effect during the same period of time;

B. Any past Closures relating to the requested Closure, along with results and outcomes of past Closures;

C. Future Closures of the same facility; and

D. Adjacent projects.

2.11.7. Swansea Elementary School

Maintaining safe and effective operations for the Swansea Elementary School shall be accounted for in the development of the construction phasing including the following:

a. Columbine Street and Clayton Street are essential roadways for access to the school and shall not be closed while school is in session, between first day of school in August to last day of school near the end of May (as defined by the schools calendar for each school year during the Construction Period). During closures of 46th Avenue, 47th Avenue will need to remain open between Clayton Streets and York Streets;

b. The Developer shall coordinate with Denver Public Schools for all Closures and operational impacts in the area of the School;

c. The Developer's TMP shall include an approach to pedestrian and bicycle movements and school traffic circulation. This approach and solution shall be coordinated with CCD and the Denver Public Schools Department of Transportation and Approved by the Department;

d. Coordination with existing Safe Routes to School Plans; and

e. Inclusion of Transportation Operations Strategies provisions of Section 2.2.5.

2.11.8. Offsite and Onsite Outfall Systems

For the construction of the Offsite Outfall System and the Onsite Outfall System, the Developer shall coordinate the construction phasing and traffic control plans with CCD, local business owners, Railroads and other Persons, as required. The Developer is responsible for obtaining required Local Agency approvals and Permits prior to submittal of TCPs to the Department for these Elements of the Construction Work.

2.11.9. Permitted Freeway Lane Closure Hours

a. I-70 permitted lane Closure hours

Without prejudice to the provisions of Section 2.11.6, Tables 2-4 and 2-5 below set out the times when the Developer shall be permitted to implement lane Closures on I-70 Mainline during the Construction Period, provided that, for certainty, no such lane Closures are permitted on a Holiday.

Table 2-4 Single Lane Closures on the I-70 Mainline from Pecos Street to Tower Road

Pecos Street to Tower Road (MM 273 to MP 285.727)				
Beginning of Section (MP)	**End of Section (MP)**	**Direction**	**Weekday**	Weekend
270.496 (Sheridan Blvd)	274.000 (I-25)	EB	7 PM to Midnight Midnight to 5:30 AM	7 PM to Midnight Midnight to 9 AM
274.000 (I-25)	270.496 (Sheridan Blvd)	WB	7 PM to Midnight Midnight to 5:30 AM	7 PM to Midnight Midnight to 9 AM
274.000 (I-25)	276.572 (SH 2)	EB	8 PM to Midnight Midnight to 5 AM	8 PM to Midnight Midnight to 8 AM
276.572 (SH 2)	274.000 (I-25)	WB	8 PM to Midnight Midnight to 5:30 AM	8 PM to Midnight Midnight to 8 AM
276.572 (SH 2)	282.563 (I-225)	EB	7 PM to Midnight Midnight to 5:30 AM	7 PM to Midnight Midnight to 9 AM
282.563 (I-225)	276.572 (SH 2)	WB	7 PM to Midnight Midnight to 5:30 AM	7 PM to Midnight Midnight to 9 AM
282.563 (I-225)	285.727 (Tower Rd)	EB	10 PM to Midnight Midnight to 5 AM	11 PM to Midnight Midnight to 6 AM
285.727 (Tower Rd)	282.563 (I-225)	WB	10 PM to Midnight Midnight to 5 AM	11 PM to Midnight Midnight to 7 AM

Table 2-5 Multi-Lane Closures on the I-70 Mainline from Pecos Street to Airport Boulevard

Pecos Street to Airport Boulevard (MP 273 to MP 284.627)								
Beginning of Section (MP)	End of Section (MP)	Direction	Two-Lane Closure		Three-Lane Closure		Four-Lane Closure	
			Weekday	Weekend	Weekday	Weekend	Weekday	Weekend
270.496 (Sheridan Blvd)	274.000 (I-25)	EB	10 PM to Midnight Midnight to 5 AM	11 PM to Midnight Midnight to 6 AM				
274.000 (I-25)	270.496 (Sheridan Blvd)	WB	10 PM to Midnight Midnight to 5:30 AM	11 PM to Midnight Midnight to 7 AM				
274.000 (I-25)	276.572 (SH 2)	EB	10 PM to Midnight Midnight to 5 AM	Midnight to 6 AM				
276.572 (SH 2)	274.000 (I-25)	WB	11 PM to Midnight Midnight to 5 AM	Midnight to 6 AM				
276.572 (SH2)	278.548 (Quebec St)	EB	10 PM to Midnight Midnight to 5 AM	11 PM to Midnight Midnight to 6 AM				
278.548 (Quebec St)	276.572 (SH 2)	WB	10 PM to Midnight Midnight to 5 AM	11 PM to Midnight Midnight to 6 AM				
278.548 (Quebec St)	279.291 (I-270)	EB	10 PM to Midnight Midnight to 5 AM	11 PM to Midnight Midnight to 6 AM				
279.291 (I-270)	278.548 (Quebec St)	WB	10 PM to Midnight Midnight to 5 AM	11 PM to Midnight Midnight to 6 AM				
279.291 (I-270)	282.563 (I-225)	EB	9 PM to Midnight Midnight to 5 AM	10 PM to Midnight Midnight to 7 AM	11 PM to Midnight Midnight to 4 AM	Midnight to 1 AM 2 AM to 5 AM		

Pecos Street to Airport Boulevard (MP 273 to MP 284.627)							
282.563 (I-225)	279.291 (I-270)	WB	10 PM to Midnight Midnight to 5 AM	10 PM to Midnight Midnight to 7 AM	11 PM to Midnight Midnight to 5 AM	Midnight to 6 AM	

b. I-270 permitted lane Closure hours

Table 2-6 below set out the times when the Developer shall be permitted to implement lane Closures on I-270 during the Construction Period, provided that, for certainty, no such lane Closures are permitted on a Holiday.

Table 2-6 Single Lane Closures on the I-270 Mainline from I-70 to Vasquez Boulevard

I-70 to Vasquez Boulevard (MM 5.351 to MP 2.358)				
Beginning of Section (MP)	**End of Section (MP)**	**Direction**	**Weekday**	**Weekend**
5.351 (I-70)	2.358 (Vasquez Blvd)	WB	9 PM to Midnight Midnight to 5:30 AM	10 PM to Midnight Midnight to 7 AM
2.358 (Vasquez Blvd)	5.351 (I-70)	EB	8 PM to Midnight Midnight to 5 AM	10 PM to Midnight Midnight to 7 AM

c. I-225 permitted lane Closure hours

Tables 2-7 and 2-8 below set out the times when the Developer shall be permitted to implement lane Closures on I-225 during the Construction Period, provided that, for certainty, no such lane Closures are permitted on a Holiday.

Table 2-7 Single Lane Closures on the I-225 Mainline from I-70 to 6th Avenue

I-70 to 6th Avenue (MP 11.997 to MP 8.954)				
Beginning of Section (MP)	**End of Section (MP)**	**Direction**	**Weekday**	Weekend
11.997 (I-70)	8.954 (6th Ave)	SB	8 PM to Midnight Midnight to 5:30 AM	6 PM to Midnight Midnight to 5 AM
8.954 (6th Ave)	11.997 (I-70)	NB	7 PM to Midnight Midnight to 5:30 AM	8 PM to Midnight Midnight to 9 AM

Table 2-8 Multi-Lane Closures on the I-225 Mainline from I-70 to 6th Avenue

I-70 to 6th Avenue (MP 11.997 to MP 8.954)								
Beginning of Section (MP)	End of Section (MP)	Direction	Two-Lane Closure		Three-Lane Closure		Four-Lane Closure	
			Weekday	Weekend	Weekday	Weekend	Weekday	Weekend
11.997 (I-70)	8.954 (6th Ave)	NB	Midnight to 5:30 AM	1 AM to 8 AM				
8.954 (6th Ave)	11.997 (I-70)	SB	10 PM to Midnight Midnight to 5 AM	Midnight to 7 AM				

2.11.10. Permitted interchange ramp lane Closure hours

a. I-70 Mainline interchange entrance and exit ramp lane Closure hours

Without prejudice to the provisions of Section 2.11.6, Table 2-9 sets out the times when the Developer shall be permitted to implement lane Closures on ramps on the I-70 Mainline during the Construction Period, provided that, for certainty, no such lane Closures are permitted on a Holiday and

i. Temporary ramp Closures will only be permitted if:

A. An alternate route or temporary detour is provided;

B. Such Closure is for a duration of 48 hours or less; and

C. It is Approved by the Department; and

ii. Two consecutive eastbound and westbound exit ramps are not permitted to be subject to a Closure at the same time.

Table 2-9 Permitted Ramp Closures on the I-70 Mainline from Pecos Street to Airport Boulevard

Pecos Street to Airport Boulevard (MP 273 to MP 284.627)						
Exit #	Crossroad Name	Direction	On-Ramp		Off-Ramp	
			Weekday	Weekend	Weekday	Weekend
273	Pecos Street	WB	6 PM to 5:30 AM 9 AM to 3 PM	6 PM to Midnight Midnight to 11 AM	8 PM to Midnight Midnight to 5:30 AM	8 PM to Midnight Midnight to 9 AM
		EB	8 PM to Midnight Midnight to 5:30 AM	8 PM to Midnight Midnight to 9 AM	6 PM to 5:30 AM 9 AM to 3 PM	6 PM to Midnight Midnight to 11 AM
275A	Washington Street	EB	6 PM to 5:30 AM	7 PM to Midnight	8 PM to Midnight	8 PM to Midnight

Pecos Street to Airport Boulevard (MP 273 to MP 284.627)						
Exit #	**Crossroad Name**	**Direction**	**On-Ramp**		**Off-Ramp**	
			Weekday	**Weekend**	**Weekday**	**Weekend**
			9 AM to 3 PM	Midnight to 10 AM	Midnight to 5:30 AM	Midnight to 9 AM
		WB	9 PM to Midnight Midnight to 5:30 AM	9 PM to Midnight Midnight to 8 AM	6 PM to 5:30 AM 9 AM to 3 PM	7 PM to Midnight Midnight to 10 AM
275B	Brighton Boulevard	EB	7 PM to 5:30 Am 10 Am to Noon	7 PM to Midnight Midnight to 10 AM	6 PM to 5:30 AM 9 AM to 3 PM	6 PM to Midnight Midnight to 11 AM
		WB	6 PM to 5:30 AM 9 AM to 3 PM	6 PM to Midnight Midnight to 11 AM	7 PM to 5:30 Am 10 AM to Noon	7 PM to Midnight Midnight to 10 AM
275C	York Street	EB	NO RAMP EXISTS		7 PM to 5:30 Am 10 AM to Noon	8 PM to Midnight Midnight to 9 AM
		WB	8 PM to Midnight Midnight to 5:30 AM	8 PM to Midnight Midnight to 9 AM	NO RAMP EXISTS	
276A	Steele Street	EB	6 PM to 5:30 AM 9 AM to 3 PM	7 PM to Midnight Midnight to 10 AM	7 PM to 5:30 Am 10 Am to Noon	7 PM to Midnight Midnight to 10 AM
		WB	8 PM to Midnight Midnight to 5:30 AM	8 PM to Midnight Midnight to 9 AM	6 PM to 5:30 AM 9 AM to 3 PM	6 PM to Midnight Midnight to 11 AM
276B	Colorado Boulevard NB	EB	8 PM to Midnight Midnight to 5:30 AM	8 PM to Midnight Midnight to 9 AM	NO RAMP EXISTS	
	Colorado Boulevard SB		6 PM to 5:30 AM 9 AM to 3 PM	6 PM to Midnight Midnight to 11 AM	NO RAMP EXISTS	
	Colorado Boulevard		NO RAMPS EXISTS		6 PM to 5:30 AM	6 PM to Midnight

Pecos Street to Airport Boulevard (MP 273 to MP 284.627)						
Exit #	**Crossroad Name**	**Direction**	**On-Ramp**		**Off-Ramp**	
			Weekday	**Weekend**	**Weekday**	**Weekend**
					9 AM to 3 PM	Midnight to 11 AM
	Colorado Boulevard NB	WB	8 PM to Midnight Midnight to 5:30 AM	9 PM to Midnight Midnight to 8 AM	NO RAMP EXISTS	
	Colorado Boulevard		NO RAMP EXISTS		8 PM to Midnight Midnight to 5:30 AM	9 PM to Midnight Midnight to 8 AM
277	Dahlia Street / Holly Street / Monaco Street (existing slip ramps)	WB	8 PM to Midnight Midnight to 5:30 AM	8 PM to Midnight Midnight to 9 AM	7 PM to Midnight 10 AM to Noon	7 PM to Midnight Midnight to 10 AM
		EB	7 PM to Midnight 10 AM to Noon	8 PM to Midnight Midnight to 9 AM	8 PM to Midnight Midnight to 5:30 AM	8 PM to Midnight Midnight to 9 AM
278	Quebec St	WB	9 PM to Midnight Midnight to 5:30 AM	9 PM to Midnight Midnight to 8 AM	9 PM to Midnight Midnight to 5:30 AM	9 PM to Midnight Midnight to 8 AM
		EB	9 PM to Midnight Midnight to 5:30 AM	9 PM to Midnight Midnight to 8 AM	10 PM to Midnight Midnight to 5:30 AM	11 PM to Midnight Midnight to 8 AM
280	Havana St	WB	8 PM to Midnight Midnight to 5:30 AM	8 PM to Midnight Midnight to 9 AM	7 PM to 5:30AM 10 AM to Noon	7 PM to Midnight Midnight to 10 AM
		EB	7 PM to 5:30AM 10 AM to Noon	7 PM to Midnight Midnight to 10 AM	8 PM to Midnight Midnight to 5:30 AM	9 PM to Midnight Midnight to 8 AM

Pecos Street to Airport Boulevard (MP 273 to MP 284.627)						
Exit #	**Crossroad Name**	**Direction**	**On-Ramp**		**Off-Ramp**	
			Weekday	**Weekend**	**Weekday**	**Weekend**
281	Peoria Street	WB	9 PM to Midnight Midnight to 5:30 AM	9 PM to Midnight Midnight to 8 AM	8 PM to Midnight Midnight to 5:30 AM	9 PM to Midnight Midnight to 8 AM
		EB	8 PM to Midnight Midnight to 5:30 AM	8 PM to Midnight Midnight to 9 AM	10 PM to Midnight Midnight to 5:30 AM	11 PM to Midnight Midnight to 8 AM
282	I-225 NB	WB	10 PM to Midnight Midnight to 5:30 AM	Midnight to 8 AM	10 PM to Midnight Midnight to 5:30 AM	Midnight to 8 AM
283	Chambers Road	EB	6 PM to 5:30 AM 9 AM to 3 PM	6 PM to Midnight Midnight to 11 AM	10 PM to Midnight Midnight to 5:30 AM	11 PM to Midnight Midnight to 8 AM
		WB	10 PM to Midnight Midnight to 5:30 AM	11 PM to Midnight Midnight to 8 AM	6 PM to 5:30 AM 9 AM to 3 PM	6 PM to Midnight Midnight to 11 AM
285	Airport Boulevard NB	EB	NO RAMP EXISTS		6 PM to 5:30 AM 9 AM to 3 PM	6 PM to Midnight Midnight to 11 AM
	Airport Boulevard SB		NO RAMP EXISTS		8 PM to Midnight Midnight to 5:30 AM	8 PM to Midnight Midnight to 9 AM
	Airport Boulevard		6 PM to 5:30 AM 9 AM to 3 PM	6 PM to Midnight Midnight to 11 AM	NO RAMP EXISTS	
	Airport Boulevard NB	WB	NO RAMP EXISTS		6 PM to 5:30 AM 9 AM to 3 PM	6 PM to Midnight Midnight to 11 AM
	Airport Boulevard SB		NO RAMP EXISTS		6 PM to 5:30 AM 9 AM to 3 PM	6 PM to Midnight Midnight to 11 AM

Pecos Street to Airport Boulevard (MP 273 to MP 284.627)						
Exit #	Crossroad Name	Direction	On-Ramp		Off-Ramp	
			Weekday	Weekend	Weekday	Weekend
	Airport Boulevard		8 PM to Midnight Midnight to 5:30 AM	8 PM to Midnight Midnight to 9 AM	NO RAMP EXISTS	

2.11.11. State Highway and arterial roadway permitted lane Closure hours

Tables 2-10 to 2-13 below set out the times when the Developer shall be permitted to implement lane Closures during the Construction Period on CDOT Roadways other than I-270 and I-225, provided that, for certainty, no such lane Closures are permitted on a Holiday. During non-permitted Closure hours, all lanes and turn lanes as they exist prior to construction must be maintained.

Table 2-10 Brighton Boulevard/York Street Single Lane Closure Times

Brighton Boulevard/York Street from 6th Ave to York St (MP 8.954 to MP 0.961)				
Arterial Single-Lane Closure Schedules				
Beginning of Section (MP)	End of Section (MP)	Direction	Weekday	Weekend
8.954 (6th Ave)	11.997 (I-70)	NB	7 PM to Midnight Midnight to 5:30 AM	8 PM to Midnight Midnight to 9 AM
11.997 (I-70)	8.954 (6th Ave)	SB	8 PM to Midnight Midnight to 5:30 AM	8 PM to Midnight Midnight to 9 AM
0.000 (I-70)	0.961 (York St)	NB	Anytime	Anytime
0.961 (York St)	0.000 (I-70)	SB	Anytime	Anytime

Table 2-11 Steele Street/Vasquez Boulevard Single Lane Closure Times

Steele Street/Vasquez Boulevard from I-70 to 56th Ave (MP 290.980 to MP 292.479)				
Arterial Single-Lane Closure Schedules				
Beginning of Section (MP)	End of Section (MP)	Direction	Weekday	Weekend
290.980 (I-70)	292.479 (56th Ave)	NB	7 PM to 8 AM 10 AM to Noon	6 PM to Midnight Midnight to 11 AM
292.479 (56th Ave)	290.980 (I-70)	SB	6 PM to 7 AM 10 AM to 11 AM	6 PM to Midnight Midnight to 11 AM

Table 2-12 Colorado Boulevard Single Lane Closure Times

Colorado Boulevard from US 40 to Vasquez Blvd (MP 5.993 to MP 9.843)				
Arterial Single-Lane Closure Schedules				
Beginning of Section (MP)	**End of Section (MP)**	**Direction**	**Weekday**	**Weekend**
5.993 (US 40)	8.660 (I-70)	NB	7 PM to Midnight Midnight to 5 PM	Anytime
8.660 (I-70)	5.993 (US 40)	SB	6 PM to 5:30 AM 10 AM to 3 PM	Anytime
8.660 (I-70)	9.842 (Vasquez Blvd)	NB	Anytime	Anytime
9.842 (Vasquez Blvd)	8.660 (I-70)	SB	Anytime	Anytime

Table 2-13 Quebec Street Single Lane Closure Times

Quebec Street from I-70 to I-270 (MP 8.553 to MP 8.898)				
Arterial Single-Lane Closure Schedules				
Beginning of Section (MP)	**End of Section (MP)**	**Direction**	**Weekday**	**Weekend**
8.553 (I-70)	8.898 (I-270)	NB	7 PM to Midnight Midnight to 2 PM	5 PM to Midnight Midnight to 1 PM
8.898 (I-270)	8.553 (I-70)	SB	6 PM to 5:30 AM 9 AM to 3 PM	5 PM to Midnight Midnight to 1 PM

2.11.12. Permitted Local Agency Roadways lane Closure hours

In performing the Construction Work on Local Agency Roadways, lane Closures shall only be permitted during the following hours:

a. Arterials, collectors – 8:30 AM to 3:30 PM; and

b. Local residential streets – 7:00 AM to 5:00 PM.

2.11.13. Queue Lengths during Construction

The Developer shall monitor queue lengths on all roads within the Project whenever a lane Closure is in effect. The Developer shall adjust the traffic control devices, including advance signing, to provide advance warning to motorists of stopped traffic.

2.11.14. Closure Violations

a. Any lane Closure that results in a breach of, or is not permitted by, any of Sections 2.11.5, 2.11.6, 2.11.7.a, 2.11.9, 2.11.10, 2.11.11 or 2.11.12 shall result in the accrual of Construction Closure Deductions in accordance with, and subject to the terms of, Schedule 6 Performance Mechanism.

b. Any Closure that results in a breach of, or is not permitted by any of Sections 2.5.3, 2.6, 2.7, or 2.9 shall result in the accrual of Construction Closure Deductions in accordance with, and subject to the terms of, Schedule 6 Performance Mechanism.

c. Any Closure set during the Construction Period (other than a full Closure permitted by Section 2.11.5.a.iii or Sections 2.11.6.a or b) without active Construction Work being performed within the Closure on any half-mile of roadway within the Closure for a duration of more than 30 minutes shall be deemed to be a Non-Permitted Construction Closure and shall result in the accrual of Construction Closure Deductions in accordance with, and subject to the terms of, Schedule 6 Performance Mechanism, provided that, for certainty, a separate Non-Permitted Construction Closure shall be deemed to commence pursuant to this Section 2.11.14.c in respect of each such one-half mile of roadway, including if there is a continuous length of one mile or more of roadway in a single lane or shoulder that has no active Construction Work being performed on it. In its individual MHT submittals the Developer may submit, for Acceptance by the Department Closures that would otherwise be so deemed to be Non-Permitted Construction Closures in order to develop a safe Closure or to allow for the Developer's reasonable productivity during the allowable Closure period.

d. Any Closure set during the Operating Period without active Routine Maintenance or Renewal Work being performed within the Closure on any half-mile of roadway within the Closure for a duration of more than 30 minutes shall be deemed to be a Non-Permitted Operating Period Closure and shall result in the accrual of Construction Closure Deductions in accordance with, and subject to the terms of, Schedule 6 Performance Mechanism. The proviso to Section 2.11.14.c shall apply equally to Closures deemed to be Non-Permitted Operating Period Closures pursuant to this Section 2.11.14.d. In its individual MHT submittals the Developer may submit, for Acceptance by the Department, Closures that would otherwise be so deemed to be Non-Permitted Operating Period Closure in order to develop a safe Closure or to allow for the Developer's reasonable productivity during the allowable Closure period.

e. For any violation of the permitted lane Closure times for traffic control, without prejudice to the operation of Schedule 6 Performance Mechanism, a written notice to stop Construction Work may be imposed on the Developer at the start of the next Working Day. Construction Work shall not resume until the Developer assures the Department, in writing, that there will not be a reoccurrence of the violation.

2.11.15. Construction Phasing Minimum Lane Requirements

a. I-70 Mainline lane restrictions

i. Minimum lane widths for travel lanes on the I-70 Mainline shall be 11 feet. Minimum outside and inside shoulder widths on the I-70 Mainline shall be two feet. Emergency pull outs shall be accommodated as required by this Section 2;

ii. If the I-70 Mainline is reduced to a single lane in one direction, the Developer shall provide a minimum clear width of 16 feet to accommodate oversize vehicles or provide alternate route planning for oversize vehicles; and

iii. The same number of existing lanes shall be maintained, unless otherwise permitted by this Section 2.

b. I-70 Mainline interchange entrance and exit ramp lane restrictions

i. Minimum lane widths for ramps shall be 11 feet;

ii. Minimum shoulder width shall be two feet; and

iii. A minimum of one lane shall remain open on all ramps, unless otherwise permitted under Section 2.11.6.

c. I-70 Mainline interchange roadways, 46th Avenue and Stapleton Drive lane restrictions

i. Minimum lane widths for I-70 Mainline interchange roadways, 46th Avenue and Stapleton Drive shall be 11 feet;

ii. Minimum shoulder width shall be two feet; and

iii. Curb and gutter sections do not require a two foot shoulder.

d. Other roadways lane restrictions

i. Minimum lane widths for local roads shall be 11 feet;

ii. Minimum shoulder width shall be two feet; and

iii. Curb and gutter sections do not require a two foot shoulder.

2.11.16. Weekly Lane Closure Notification

The Developer shall submit, for Information but without prejudice to any obligation of the Developer to obtain Approval or Acceptance from the Department of any specific Closure pursuant to any other terms of the Project Agreement, including this Section 2, lane Closures and Construction Work hours to the Department by Thursday 10:30 a.m. of the week in advance of implementation (for work Sunday through Saturday), unless required by construction emergencies or other reasonably unforeseen events. The Lane Closure Report, as provided in Appendix A to this Section 2, shall be used for the weekly submittal. The Lane Closure Report shall be updated and resubmitted to CDOT daily if any changes are made to the original submittal.

2.11.17. Noise Control Ordinance

The Developer shall obtain required Permits and comply with all Local Agency requirements for noise control ordinances in relation to Construction Work. The noise ordinance mitigation and Construction Work hours should be reflected on the MHT and TCP.

2.11.18. Detour Routes

Only State highways shall be used for I-70 Mainline detour routes. Local Agency Roadways proposed to be used as detours shall be approved by the Local Agency. For any Closure of a roadway that is designated as a bike route, as defined by the Local Agency, the Developer shall provide a detour route with equivalent bicycle access and adequate signage. All detour routes shall be the shortest length possible using equivalent or greater capacity roadways or as otherwise Approved by the Department. Pedestrians should be detoured to nearest available route where Closures are required, with the desired pedestrian detour not exceeding 1,000 feet in out of direction travel, unless otherwise Approved by the Department.

2.11.19. Trail and Pedestrian Impacts

a. The Developer shall comply with all requirements of Schedule 17 Environmental Requirements;

b. Existing trail systems, temporary trails, sidewalks, and pedestrian routes shall be maintained at all times. The Developer shall meet all requirements of the Americans with Disabilities (ADA) Act for all Construction Work that impacts existing trails and pedestrian facilities or that will be used for temporary detour routes;

c. Temporary trail detours shall meet requirements for trail detours as outlined in the CCD *Construction Detour Standards for Bikeways and Multi-Use Trails*; and

d. The following restrictions shall apply to existing trail systems in the vicinity of the Project:

i. No trail closures shall be allowed; and

ii. Temporary trail detours will be allowed under the following conditions:

A. PIP requirements shall be identified and appropriate public notifications provided; and

B. The Developer shall comply with the *CCD Construction Detour Standards for Bikeways and Multi-Use Trails*.

2.11.20. Emergency Pullouts

a. For facilities under construction, the Developer shall provide Emergency pullouts on the I-70 Mainline for disabled vehicles, staging of incident management, and law enforcement vehicles, when shoulder widths are less than eight feet at any point along a 0.5 mile stretch. Emergency pullouts shall be provided at the outside shoulder, between each interchange or at 0.5 mile spacing, whichever is less. For determining 0.5 mile spacing, the emergency pullouts shall be measured from the center of the first pullout to the center of the next pullout. Interchange distance shall be measured from ramp gore to ramp gore in the same direction of travel. The minimum pullout length shall be 150 feet, not including transitions. Pullouts shall be placed on the outside shoulder only; and

b. Transitions shall be made at 15:1 or greater. The minimum pullout width shall be 14 feet measured beyond the travel lane. The pullouts shall be signed for emergency parking only, shall have a paved surface, shall include advance signing in compliance with the FHWA *Manual on Uniform Traffic Control Devices* (MUTCD), and shall not be subject to ponding or other weather-related conditions that could render them unsafe or ineffective. Snow removal in Emergency pullouts is the responsibility of the Developer.

2.11.21. Courtesy Patrols

The Developer shall coordinate with the courtesy patrols as part of the implementation of the IMP. Schedule 11 Operations and Maintenance Requirements details the courtesy patrol requirements.

2.11.22. Uniformed Traffic Control

a. The Developer shall employ off-duty police officers to provide traffic control and traffic enforcement throughout the Project as required. Uniformed Traffic Control includes; scheduling, coordinating and furnishing a uniformed police agency officer from the Local Agency and/or the Colorado State Patrol (CSP) to perform uniformed traffic control for any traffic control Activity including but not limited to:

i. Lane Closures to I-70 Mainline (including ramps);

ii. Night construction on I-70 Mainline (including ramps);

iii. Lane Closures on Local Agency or CDOT Roadways;

iv. Night construction on Local Agency or CDOT Roadways;

v. Periods of active Traffic Control Management on all Roadways; and

vi. As necessary to ensure safety and efficient operations as identified in the Contractor's TMP.

b. The uniformed police agency officer shall have completed *The Safe and Effective Use of Law Enforcement Personnel in Work Zones* training course. The Developer shall provide to the Department for Information copies of documentation certifying the officer's successful completion of this course.

c. If not provided by the Local Agency and/or the CSP, the Developer shall furnish a vehicle for the officer to use in performing uniformed traffic control. The Developer shall be responsible for licensing, insuring, servicing, and fueling the vehicle. Each traffic control vehicle shall furnish Class 1 SAE certified light bar and control panel for exclusive use by uniformed police agency officers while performing Uniformed Traffic Control. The light bar shall have the following configuration:

i. Minimum of 44 inches in length, and shall be either permanently or temporarily attached to the top of the vehicle;

ii. Flash red on the driver side and blue on the passenger side;

iii. Equipped with an amber-colored directional device in the rear of the bar;

iv. Have alley and takedown lights;

v. Control panel shall be capable of controlling the front of the bar and the rear of the bar separately; and

vi. The traffic advisor shall be controlled separately.

d. The light bars shall be mounted on traffic control vehicles, and shall be maintained in good operating condition at all times. The Developer shall obtain a permit from the police or sheriff department, as appropriate, for the use of the light bars. The Developer shall keep the light bars covered at all times when the traffic control vehicle is being used by someone other than the authorized uniform police agency officer.

2.11.23 CTMC Central 70 Support

During Construction, the Developer shall provide a staff person at the CTMC, to monitor I-70 traffic operations 6:30 am to 8:00 pm for weekdays, and 10:00 am to 7:00 pm for weekends. Developer shall monitor regardless of weather conditions. Any extensions of operating hours due to Emergencies, Severe Weather Event or planned Special Events as identified by Developer and Accepted by the Department, or as required by the Department, (up to 30 hours per Contract Year for all required vehicles, dispatch staff, and required personnel and equipment) shall be the responsibility and cost of the Developer.

The staff person shall be trained and knowledgeable with working with ITS cameras, digital message signs, ITS devices and CMTC operating procedures. Monitoring traffic operations will be for I-70 Mainline between I-25 to Tower Rd. Work shall include coordination between the Developer, the Department, CCD and Developer's Courtesy Patrol.

The Department will furnish the work station and computer.

2.12. Construction Requirements

2.12.1. The Developer shall provide installation, maintenance, and removal of all temporary traffic control devices.

2.12.2. Temporary Traffic Control Devices

a. Construction Signing

Construction signing within the Project and all detours shall comply with CDOT *Standard Specifications*, the MUTCD and all other applicable standards set forth herein. Wood signposts conforming to CDOT *Standard Specifications* will be allowed for installation of temporary signs. No posting on Utility poles or other permanent sign posts. The Developer shall submit sign layouts for all special signs of any size to the Department for Acceptance.

b. Temporary Traffic Signals and Temporary Ramp Meter Stations

Temporary traffic signals and ramp meter shall comply with Schedule 10, Section 11 Signing, Pavement Marking, Signalization, and Lighting. Upon discovery of a signal malfunction, the Developer shall immediately notify the entity responsible for the signal.

c. Pavement Marking and Signing

The Developer shall furnish, apply and remove pavement marking material in accordance with CDOT *Standard Specifications*. Pavement striping shall meet the conformity of lines (including no overspray), dimensions, patterns, locations and details established in the Developer's TCP and MHT. The Developer shall comply with the criteria for retro reflectivity in Table 2-14 for striping material.

i. Hydro blasting, or other methods that do not result in scarring of permanent pavements shall be used for removal of temporary striping; and

ii. Pavement marking striping shall be maintained and measured for performance.

2.12.3. Pavement Markings During Construction

a. The Developer shall provide all pavement markings meeting the minimum retro-reflectivity as shown in Table 2-14. The Developer shall use a calibrated retro-reflectometer and perform the test on each line strip in conformance with ASTM E 1710 or AASHTO TP111 procedures. The following readings shall be collected for each day striping test is being conducted:

i. Within a mile test section, collect 10 readings for each longitudinal line stripe, at no less than 40 feet intervals; and

ii. Where striping is less than 500 feet in length, collect readings at 50 foot intervals.

b. The calibration for the retroreflectometer shall be verified every day, prior to the readings being taken. The retroreflectivity readings shall be taken no sooner than 3 Calendar Days and no later than 14 Calendar Days after the marking is tack free.

Table 2-14 Pavement Marking Reflectivity

Color	Retro-reflectivity Reading (R) in a one-mile section (mcd/m^2/lux)
White	R $\geq$ 375 (Newly applied marking less than 3 weeks old) Newly applied marking minimum 375 mcd/m^2/lux. Less than this reading for newly applied marking; remove and replace, impose a Working Time Violation Incident and stop work.
Yellow	R $\geq$ 250 (Newly applied marking less than 3 weeks old) Newly applied marking minimum 250 mcd/m^2/lux. Less than this reading for newly applied marking; remove and replace, impose a Working Time Violation Incident and stop work

c. Prior to taking retro-reflectivity readings, the Developer shall remove at the retro-reflectivity reading locations any excess beads placed during marking application.

2.12.4. Glare Screen, Barrier Reflector Strips and of Temporary Traffic Control Devices

a. The Developer is required to have 18 inch glare screen on all temporary barrier located between I-70 Mainline opposing traffic located within four feet of the barrier;

b. Barrier reflector strips shall be installed on all temporary barrier, both right and left sides, as per the CDOT Standard S-612-1. The spacing between each three foot panel shall be no more than seven feet; and

c. Delineators shall be used throughout the Project, including lighted areas.

2.12.5. Maintenance of Temporary Traffic Control Devices

The Developer shall be responsible for the maintenance of all temporary traffic control devices within the Project, including the local street system. Temporary traffic control devices shall meet the acceptable standard as defined by the ATSSA *Quality Guidelines for Work Zone Traffic Control Devices*.

2.12.6. Detours and Detour Pavement

a. Any detour pavement shall be designed according to the requirements as provided in Schedule 10, Section 6 Roadway Pavements;

b. Detour pavement locations shall be generally described in the Developer's TMP and detailed in the Accepted TCP;

c. The Developer shall obtain written approval from the affected Local Agency prior to use of any local streets for detours;

d. The Developer shall begin removing all detour signs immediately after any Closure is removed and all detour signs shall be removed within 2 hours of the Closure being removed;

e. Covering or masking of signs shall be allowed on signs permanently installed, if detour is to be reused. All temporary signs shall be removed in accordance with Section 2.12.6.d;

f. Detours that use existing street pavements shall be subject to pavement repair or replacement where it is determined that the condition of the existing pavement has noticeably deteriorated over the duration of its use as a detour; and

g. The Developer shall be responsible for damage on any existing streets used for detours and shall repair any damages to the existing condition, as directed by the Department.

2.12.7. Temporary Lighting

Any existing lighting that is not in operation when NTP 2 is issued shall be remedied by the Developer within 30 Calendar Days after the issuance of NTP 2. Developer shall ensure that existing lighting that has yet to be impacted by the Construction Work will be maintained and operated at its current level and will not be required to meet the minimum criteria in Table 2-15.

The Developer shall provide all temporary lighting for traffic shifts, detours, emergency pull out locations, merge/diverge locations and intersections within Construction Work, which lighting shall meet the minimum requirements as shown in Table 2-15.

The Developer shall provide temporary lighting for all existing (including locations where existing sidewalk is not present) and proposed pedestrian and bicycle movements (including detour routes) between Brighton Blvd and Garfield St. within Construction Work, which lighting shall meet the minimum requirements as shown in Table 2-15.

Light shields shall be required if located adjacent to residential structure.

Table 2-15 Temporary Lighting

	Design Method	Luminance Range (cd/m²)	Uniformity (avg:min)	Veiling Luminance Ratio (L_{vmax}/L_{avg})	Visibility Level	Illuminance Range (avg fc)
Freeway, Interchanges, Highway Underpasses	Luminance	0.4 – 0.6	3.5	0.3		
	STV	0.3 – 0.5	6.0 (max:min)		2.6 – 3.8	
	Illuminance		3.0	0.3		0.4 – 1.4
Municipal Streets	Luminance	0.3 – 0.8	3.0 – 6.0	0.4		
	STV	0.3 – 0.6	6.0 – 10.0 (max:min)		1.6 – 3.8	
	Illuminance		4.0 – 6.0	0.4		0.4-1.2
Pedestrian and Bike ways	Illuminance (Mixed vehicle and pedestrian)		4.0			2.0
	Illuminance (pedestrian only)		4.0			1.0
	Illuminance (Walkways/ Bikeways)		4.0			0.5

2.12.8. Traffic Accidents within Traffic Control Zones

The Developer shall provide CDOT with weekly updates of all recorded accidents located within the Project traffic control zone(s). The Developer shall coordinate with local jurisdictions as necessary to request and obtain (including any required payment) for the recorded accident reports. The accidents shall be discussed at the weekly MOT Task Force Meetings to identify potential problem locations.

2.13. Deliverables

At a minimum, the Developer shall submit the following to the Department for Information, Acceptance, or Approval in accordance with the time frames specified below:

Table 2-16 Deliverables

Deliverable	Information, Acceptance, or Approval	Schedule
List of MOT Task Force members	Acceptance	30 Calendar Days after issuance of NTP1
Transportation Management Plan (TMP)	Approval	Prior to the issuance of NTP2
Incident Management Plan (IMP)	Acceptance	30 Calendar Days after issuance of NTP1

Deliverable	Information, Acceptance, or Approval	Schedule
Department MOT Variance request	Approval	30 Calendar Days prior to implementation
Local Agency MOT Variance approval	Information	Promptly after MOT Variance approved
Modifications to RTD station access or bus stop locations	Information	Prior to RFC Documents
Lane Closures and Construction Work Hours	Information	Thursday 10:30 AM the week in advance of implementation
Requests for full Closures permitted by Section 2.11.4 or 2.11.6	Acceptance	As required
MOT operations and analysis	Acceptance	Submit with TCPs
Temporary Traffic Control Plan (TCP)	Acceptance	Prior to RFC Documents
Method of Handling Traffic (MHT)	Acceptance	14 Calendar Days prior to implementation
Uniformed traffic control certifications	Information	14 Calendar Days prior to implementation
Sign layouts for special signs	Acceptance	Submit with TCPs

2.14. Appendices

Appendix A Lane Closure Report

Appendix A
Lane Closure Report

LANE CLOSURE REPORT FOR THE WEEK OF:		Prepared by:	
Highway No:		Region:	
Project Location Description (nearest town, intersection, etc.)		Project Info Line/Email:	
Proj. Start Date:	Est. Completion Date:	Brief Description of Project:	
CDOT Project Engineer:		Phone:	Mobile:
Contractor & Contact (Prime)		Phone:	Mobile:
Other Contact:			

DAY	DATE	TIMES	LOCATION OF CLOSURE	MM# to MM#	Direction	MHT #(s)	LANE(S) CLOSED	DESCRIPTION OF CURRENT WORK
SUN					**N S** **E W**			
MON					**N S** **E W**			
TUE					**N S** **E W**			
WED					**N S** **E W**			
THU					**N S** **E W**			
FRI					**N S** **E W**			
SAT					**N S** **E W**			
OS/OW Restrictions, Detours, Speed Reductions, Etc.:								

3. ITS AND TOLLING EQUIPMENT

3.1. General

3.1.1. The Developer is responsible for:

a. the design and construction of the Intelligent Transportation System (ITS) and Electronic Toll Collection (ETC) infrastructure Elements for the Project in accordance with this Section 3; and

b. maintenance of the ITS and ETC Elements of the Project in accordance with this Section 3, including the Elements identified as Developer responsibility in Appendix B Responsibility Matrix to this Section 3. This includes maintenance of the existing ITS devices and fiber optic cables in accordance with Schedule 11 Operations and Maintenance Requirements. Inventory of CDOT ITS devices and CCD cameras is included in the Reference Documents as information only.

3.1.2. The ITS Elements include various devices, such as Dynamic Message Signs (DMS), Side Mount Variable Message Signs (SMVMS), Variable Toll Message Signs (VTMS), Closed Circuit Television (CCTV) camera, Microwave Vehicle Radar Detection (MVRD), Travel Time Indicators (TTI), Road Weather Information Systems (RWIS), Environmental Friction Sensors (friction sensors), Lane-Use Signals (LUS), Doppler radar, Automatic Traffic Recorders (ATR), and Dedicated Short Range Communications (DSRC) Radios. In addition, the ITS system includes the various components for CCD and CDOT that make up the communication system, such as conduit, fiber optic cable, fiber optic cable network, fiber splicing, Ethernet switches, routers, racks, rack mounts, Uninterruptable Power Supply (UPS), power generators, grounding, cabinets and all incidental equipment and materials required to provide a fully functional system.

3.1.3. The Developer shall be responsible for coordinating with the ETC System Integrator for design and construction of the ETC system. The ETC System Integrator and the Developer shall be responsible for their respective ETC Elements for design, procurement and construction as outlined in this Section 3. The ETC System Integrator is responsible for procurement and installation of Automatic Vehicle Identification (AVI) Readers, Automatic License Plate Recognition (ALPR) Cameras, Loop Detectors, Lane Controllers, Transaction Status Indicator Beacons, ETC system Ethernet network equipment and plaza servers. The ETC system will rely on CDOT's 216 strand fiber optic communications network, referred to as the backbone, to link the ETC field devices to the ETC back-office.

3.1.4. All existing CDOT ITS devices, equipment, supports, and structures within the Project shall be replaced by the Developer, unless specifically noted otherwise in this Section 3. This shall include items such as all existing DMS, CCTV cameras, MVRDs, TTIs, RWIS, ATRs, cabinets, and Ethernet switches. Existing devices may be reset temporarily to maintain operability during construction, however all permanent installations require new ITS devices, equipment, supports, and structures. All existing devices replaced on the Project shall be salvaged and returned to CDOT.

3.1.5. The ITS and ETC fiber optic communications network extends beyond the Construction Work area and includes interconnections between nodes. This includes Node 1 located at I-25 and 38th Ave/Fox St. (3701 Park Ave), Southmoor Node (3857 S. Monaco Pkwy.), Node 2 near I-25/70th (525 E. 70th Ave.), a new node to be constructed with the Project at I-70/Airport Blvd., Region 1 KOA communications room at Colfax Ave./Tower Rd., E-470 Authority Data Center at E-470/6th Ave. in Aurora and the Colorado Transportation Management Center (CTMC) in Golden (425 Corporate Circle, Golden 80401).

3.1.6. The Developer shall install a new node building at I-70/Airport Blvd. which shall house the ETC equipment and the ITS system equipment along with the installation and termination of CDOT's 216 backbone cable connecting the node building equipment to the ETC and the ITS field equipment. The Developer's and the ETC System Integrator's responsibilities are further defined in this Section 3.

3.1.7. The Developer shall construct a network equipment room at the Cover which will house the Cover MEP systems and network equipment, as described in Schedule 10, Section 12 and this Section 3.

3.2. Applicable Standards

All Construction Work required to be performed by the Developer pursuant to this Section 3 shall comply with the Construction Standards, the requirements listed in this Section 3, Good Industry Practice and Phase I Signing and Striping Plan included in the Reference Documents.

3.3. Legacy Equipment

Due to the risk of obsolescence, equipment should not be purchased or ordered more than six months prior to the installation date for any piece of equipment without prior written Acceptance by the Department.

3.4. ITS and Tolling Manager, Task Force Meetings, and Schedule

3.4.1. ITS and Tolling Manager

a. From NTP1 to Final Acceptance, the Developer shall employ a full time ITS and Tolling Manager ("ITM") to be responsible for coordinating and ensuring compliance with all ITS and tolling design, construction, integration, scheduling and operational requirements;

b. The ITM shall be able to demonstrate a minimum of 10 years of experience with ITS design and construction, and the individual's resume shall be submitted to the Department for Acceptance prior to NTP1; and

c. If for any reason Developer wishes to remove and/or replace the ITM, the change requires the Enterprises' Acceptance. Developer shall promptly deliver a notice to the Enterprises for Acceptance, setting out the reason for such removal and/or replacement, together with:

i. The identity, expertise and experience of the proposed replacement meeting the requirements of Section 3.4.1.b; and

ii. Any such support information or evidence as the Enterprises may reasonably require in relation to such matters.

d. The ITM shall have the authority to stop or redirect the Work at any time as needed, and shall be responsible for the following:

i. Ensure that all individuals working on design, construction and integration for ITS and tolling are qualified and have relevant experience;

ii. Be the primary liaison between the Developer and the Department on all ITS and tolling related issues;

iii. Be the lead responder to any non-compliance findings for ITS or tolling issued by the Department or the Independent Quality Control Manager ("IQCM") for the Work;

iv. Provide support to the IQCM to ensure inspection checklists cover all ITS and tolling requirements;

v. Ensure full compliance with all ITS and tolling requirements in the Work;

vi. Ensure that all ITS and tolling related tasks are performed by qualified professionals pursuant to Section 16.3 of the Project Agreement, and provide the resources to perform the Work needed to meet the ITS and tolling requirements;

vii. Lead ITS and tolling cross-disciplinary reviews of all design submittals in order to confirm compliance with all ITS and tolling requirements and design commitments;

viii. Perform reviews of proposed Developer Changes prior to submittal to the Department of any related Developer Change Notice pursuant to Schedule 24 (Change Procedure). The submittal of a proposed Developer Change Notice by the Developer to the Department shall include documentation that the ITM has performed due diligence and that the proposed Developer Change complies with the ITS and tolling requirements;

ix. Measure the number and severity of non-conformances with the ITS and tolling requirements and include a monthly summary of the findings at the task force meetings, including the steps that will be taken to improve processes going forward;

x. Coordinate the participation of the appropriate members of the Developer's team for, and lead, ITS/tolling task force meetings as referred to in Section 3.4.2 below; and

xi. Direct, oversee and coordinate with the staff person that is required at the CTMC per Schedule 10, Section 2, Maintenance of Traffic.

e. The ITM's responsibilities shall not be delegated to production staff or any other Person without Department Approval.

3.4.2. ITS/Tolling Task Force Meetings

a. Developer shall conduct ITS/tolling task force meetings pursuant to Section 9.2 of Schedule 8 *(Project Administration)* and this Section 3.4.2;

b. ITS/tolling task force meetings shall be held on a weekly basis during the period beginning with NTP1 through the Final Acceptance Date to discuss ongoing design, construction, integration and operations topics related to the ITS and tolling elements of the Work. During the Operating Period, the Department may require such meetings on an as needed basis; and

c. The ITM shall coordinate and lead the ITS/tolling task force meetings pursuant to Section 3.4.1.

3.4.3. Schedule

a. The Developer shall detail all work items and requirements for the ETC system and ITS design, equipment procurement, installation, testing, and integration into its Baseline Schedule as described within this Section 3. This includes schedule requirements, Deliverables, and time periods as specified in this Section 3 for work to be performed by the ETC System Integrator and in the Central 70 Testing and Integration Plan in the Reference Documents.

3.5. The ETC System Integrator and Developer Responsibilities

3.5.1. The ETC System Integrator shall be responsible for procuring, installing and integrating the ETC system in accordance with the E-470 TSA and the E-470 Installation Agreement. The ETC System Integrator will procure and install the loop detector wires, transaction status indication beacons, ALPR cameras, AVI antennas over the Tolled Express Lanes, and any ETC equipment required in the cabinets that is not included with the cabinet per Project Special Provisions, Appendix A to this Section 3. The ETC System Integrator shall test the ETC equipment to ensure that the toll tags are accurately read. The ETC System Integrator shall be responsible for any software necessary to collect tolls, compile transactions from the ALPR cameras, and the ETC system Ethernet network equipment.

3.5.2. Although the ETC System Integrator shall be responsible for the installation and configuration of the ETC equipment per this Section 3, the Developer shall be responsible for all of the ETC design per ETC requirements. The Developer shall be responsible for the procurement and construction of the ETC lane controller cabinets and associated foundations; all work and materials associated with the toll point UPSs; all conduit needed to connect to: the ETC lane

controllers, AVI antennas, loops, ALPR cameras; transaction status indication beacons, and other toll related equipment, all overhead structures and AVI mounting brackets; all ALPR camera poles and bases; and all conduits, cabling, patch panels and terminations needed to provide communications and power to the cabinets. The design of the ETC system, network, fiber connectivity, locations of the cabinets, devices, foundations, and conduits shall be Approved by the ETC System Integrator and the Department.

3.5.3. The Developer shall provide the power, lateral conduits, and lateral fiber to all ETC equipment and provide and terminate all fiber and fiber patch cables at field cabinet locations and node buildings.

3.5.4. The Developer shall be responsible to coordinate and provide all traffic control for the ETC System Integrator. The ETC System Integrator will be required to follow the permitted Closure hours outlined in Schedule 10, Section 2, Maintenance of Traffic for equipment installation, configuration, integration, and testing activities on the Project. The ETC System Integrator will be required to schedule all work activities with the Developer and provide at least 48 hours' advance notice of any Closures needed for their work. The Developer shall coordinate Closures with the ETC System Integrator.

3.5.5. The Developer shall be responsible for coordination and scheduling of the Construction Work with the ETC System Integrator. Developer shall coordinate the design of Project Elements between the ETC System Integrator and CDOT's ITS network. The ETC System Integrator and the Developer shall work together and coordinate Construction Work schedules. The Developer shall be responsible for coordinating with the ETC System Integrator, including so as to avoid any delays to the Project due to scheduling this work.

3.5.6. Equipment Procurement and Configuration

The Developer shall include in its Baseline Schedule 120 Working Days from the date the equipment is ordered by the ETC System Integrator until it is received. The Developer shall include in such schedule, and allow the ETC System Integrator, an additional 20 Working Days for configuration of the ETC equipment.

3.5.7. Installation and Integration

Prior to the ETC System equipment installation and integration, the Developer shall meet the following conditions:

a. Cabinet back and side panel provided to the ETC System Integrator 25 Working Days, at a minimum, prior to start of installation of tolling devices;

b. Permanent barrier or guardrail installed;

c. Tolling cabinets and pull boxes installed;

d. Tolling UPS and cabinet installed and properly sealed;

e. Loop wire conduits installed from the cabinet to the stub up locations;

f. Final pavement placed, debris removed, and lanes swept where loops are installed;

g. Final pavement markings are identified in the field;

h. ALPR camera bases and poles installed;

i. Overhead structure, mounting brackets, and conduit installed;

j. Pull tape installed in all conduit runs from the ETC cabinet to the device locations;

k. Permanent power and communications connections fully operational;

l. All fiber and power testing to toll locations (including UPS), have been confirmed for functionality of toll cabinets and lateral fiber. Testing to be performed per the Central 70 Testing and Integration Plan included in the Reference Documents;

m. As-built documentation of fiber path and terminations at toll points and node buildings for ETC network;

n. All fiber patch cables installed and patch panels labeled;

o. Method of Handling Traffic (MHT) submitted and reviewed by the ETC System Integrator. Coordinated schedule for closure of Tolled Express Lanes to allow for the ETC System Integrator to perform installation, mapping, and testing;

p. Photos sent to the ETC System Integrator for review of readiness prior to work; and

q. Walkthrough scheduled with the ETC System Integrator to verify the location readiness for installation and integration of the ETC devices.

The Developer shall provide the ETC System Integrator a minimum of 48 hours' advance notice that a toll point site is ready for installation. The Developer shall include in its Baseline Schedule, and provide the ETC System Integrator with, a minimum 14 Calendar Days of unrestricted access to each tolling location to allow installation and integration of the ETC devices. Installation and integration by the ETC System Integrator will need to be scheduled sequentially, and not concurrently. Once the integration has been completed at a toll point, the Department will need to perform a preliminary inspection.

3.5.8. Lane Testing

Prior to the ETC System Integrator lane testing, the Developer shall have completed all of the requirements in Section 3.5.7 of this Section 3 and the ETC System Integrator shall have completed its installation and integration activities. In addition, the Developer shall allow live traffic through test toll locations in final alignment, for a minimum distance of 500 feet on either side of the toll structure. All final pavement markings shall be in place. Developer shall have all CDOT CCTV cameras and DMS installed, field tested, communications to CTMC and E-470 verified and fully operational prior to lane testing.

The Developer shall include in its Baseline Schedule, and allow the ETC System Integrator, a minimum 14 Calendar Days per site for the conduct of lane testing and processing of the respective data. Developer shall allow for the following:

a. A minimum of 12,000 vehicles within a 24-hour period; and

b. A traffic type mix to travel through test locations during day and night.

Work to be scheduled at sequential locations and not concurrently. The ETC System Integrator testing work to be conducted at all toll points.

3.5.9. Final Acceptance Testing

Prior to the ETC System Integrator's final acceptance testing of the ETC equipment, the Developer shall have completed all of the requirements in Section 3.5.8 of this Section 3. In addition, traffic must be travelling through the final alignment for all toll points and final striping must be in place.

For final acceptance testing of the ETC system, the ETC System Integrator requires testing and evaluation under normal traffic patterns to verify that the ETC back-office system is functioning correctly. The Developer shall include in its Baseline Schedule a minimum 70 Working Days for the conduct of final acceptance testing from the date that the last tolling point lane testing is completed and traffic is operating in final configuration through the toll points. The Developer shall provide advance notice to the ETC System Integrator of any lane Closures or other impacts to traffic through the toll points during this final acceptance testing period.

3.6. Zayo and Developer Responsibilities

3.6.1. The Utility Relocation Agreement (URA) between CDOT and Zayo, provided in the Reference Documents, defines the responsibilities of the parties as outlined in this Section 3 and the Developer shall be responsible for performing all Utility Work in accordance with Utility Work Orders issued pursuant to the URA and Schedule 10, Section 4 Utilities.

a. Zayo will be responsible for any Utility Relocations with regards to the shared resource facility in accordance with the User Agreement dated 6-27-03 and Agreement for Shared Resources Project dated 3-11-1999 from Quebec St to Airport Blvd; and

b. Developer shall be responsible for the design and installation of the Zayo Utility Relocation from York St to Quebec St in accordance with the URA.

3.6.2. Zayo will be responsible for the following:

a. Zayo will furnish six 6-inch conduits (two conduits will be equipped with seven 1 ¼-inch innerducts) and all manholes and pull boxes needed for the Zayo facility from York St. to Quebec St. Zayo will furnish a 288-strand fiber optic cable for Zayo's facility from York to Quebec St. and shall be responsible for all splicing of Zayo fiber. Thirty-six strands of Zayo's 288 strand fiber optic cable are allocated to CDOT and is referred to as the shared resource;

b. Zayo will furnish a 216-strand fiber optic cable for CDOT's facility between Node 1 and the proposed node building at I-70/Airport Blvd.;

c. Zayo will furnish a 96-strand fiber optic cable (84 strands single mode and 12 strands multi-mode) for City and County of Denver (CCD) facility between Washington St. and Quebec St.; and

d. Zayo will perform all splicing to the existing or proposed shared resource.

3.6.3. The Developer shall be responsible for the following:

a. The Developer shall be responsible for all work to maintain connectivity between existing devices and fiber and the proposed shared resource with the exception of the fiber splicing to the shared use facility. The Developer shall furnish and install all materials (including, conduit, fiber, pull boxes, splice closures and manholes) required to maintain connectivity to existing devices;

b. All splicing to the existing or proposed shared resource will be performed by Zayo and the cost for the splicing shall be paid to Zayo by the Developer. The Developer shall be responsible for scheduling the work with Zayo;

c. The Developer shall be responsible for the relocation of any existing CCD fiber backbone or laterals impacted within the Site per Schedule 10, Section 4 Utilities and Schedule 10, Section 11 Signing, Pavement Markings, Signalization, and Lighting;

d. The Developer shall furnish and install all conduit, pull boxes, manholes for CDOT and CCD facilities per this Section 3;

e. The Developer shall furnish and install a 96-strand fiber optic cable (84 strands single mode and 12 strands multi-mode) for CCD at all locations along I-70 where CCD's existing fiber backbone is impacted east of Quebec St. The Developer shall also furnish and install a 96-strand fiber optic cable (84 strands single mode and 12 strands multi-mode) for CCD between Quebec St and Colorado Blvd. This is in addition to the fiber that Zayo is providing as CCD has a second existing 96-strand fiber backbone in this segment;

f. The Developer shall be responsible for furnishing and installing all pull tape, tracer wire, conduit plugs, concrete aprons, location markers and other associated items or materials required for installation of the manholes, pull boxes, and conduit furnished by Zayo; and

g. The Developer shall be responsible for the design and installation of the relocated Zayo, CDOT, and CCD facilities; including all conduit, manholes, pull boxes, and fiber.

3.6.4. The Developer shall coordinate schedules with Zayo to avoid delays. Without prejudice to the Developer's rights arising as a result of the occurrence of a Supervening Event, the Department will not be responsible for delays. As the section between York St. and Airport Blvd. is a shared resource that runs longitudinally alongside I-70, the Developer shall be aware that a 45 Calendar

Day notice by Zayo to its customers is required for any service disruptions and shall be built into the Developer's Project Baseline Schedule. Reference Schedule 8 Project Management for scheduling requirements.

3.7. Colorado Transportation Management System Software and Video Management System

3.7.1. Colorado Transportation Management System (CTMS) software refers to the computer program used at the CTMC to control CDOT's statewide DMS's, Active Traffic Management (ATM) on US 36, I-25, and I-70 West, monitors the equipment connected to the software in real time for failures, calculates travel time using the TTIs, MVRDs and Doppler radars, utilizes the RWIS statewide for road conditions, and replicates information to the State's website, www.cotrip.org. This website is in a usable format for the public to view in real time.

3.7.2. No CTMS software development shall be needed by the Developer. Any new models of equipment that may require software upgrades to the CTMS will be at the responsibility of the Department.

3.7.3. The video management system software controls the statewide camera network and is a shared camera network with multiple participating agencies in the Denver Metro area. Any new cameras added to the I-70 Mainline shall be incorporated into the video software, NICE® Vision, and shall be the responsibility of the Developer. The Developer shall be responsible to provide qualified staff that are capable of camera installations, terminations and any trouble shooting required until the camera is fully operational. The Developer shall provide licensing required for the existing video software associated with new camera installations.

3.8. Design and Construction Requirements

3.8.1. The Developer shall design and construct the ITS and ETC infrastructure components as outlined in this Section 3. All devices and equipment shall be new unless the Department Approves that an item may be reused. This does not apply to devices or equipment to be reset for temporary use during the Construction Period. No part or attachment of any equipment shall be substituted or applied contrary to the manufacturer's recommendations and Good Industry Practice.

3.8.2. The Developer shall submit a preliminary (30% level) ITS roll plot with locations of all ITS and ETC infrastructure described within this Section 3. The ITS roll plot shall also include the Ramp Meters.

3.8.3. The Developer shall submit both final (100%) and RFC level ITS and ETC design plans and details. The ITS and ETC design plans and details shall include, at a minimum, the following:

a. ITS plan sheets detailing all temporary and permanent ITS, and ETC equipment and infrastructure. The ITS plan sheets shall include existing and proposed utilities, proposed roadway and pavement markings, and proposed sign structure locations;

b. Plans and details for the proposed Node Building at I-70 and Airport Blvd, proposed network equipment room at the Cover, Node 1, Node 2, KOA communications room, and the Southmoor node;

c. Site specific maintenance access shall be shown on the ITS plans for every ITS and ETC device, manhole with splicing, and cabinet. Maintenance vehicle parking and personnel access shall be detailed on the plans; and

d. ITS and ETC device and infrastructure details.

3.8.4. The Developer shall provide all supporting reports and design calculations, including electrical calculations, with the final (100%) and RFC submittals.

3.8.5. The Developer shall submit ITS and ETC device and material specification sheets for Acceptance to the Department prior to ordering the equipment. ITS infrastructure locations need to incorporate elements from this Section 3 and other applicable Sections of this Schedule 10 and the Phase 1 Signing and Striping Plan included in the Reference Documents. Fiber backbones, ITS and ETC devices and infrastructure shall be placed to accommodate the Ultimate configuration.

3.8.6. Conduit, Fiber and Node Buildings

a. Design Requirements

i. The Developer shall design new and separate conduit systems (including all hardware, fasteners, and accessories) for communication and power control systems. Longitudinal conduits for the communications network shall be installed within the Right-of-Way (ROW) and as close to the ROW line as practical. The CDOT backbone shall cross I-70 at only one location between Washington St. and Airport Blvd., or as Approved by the Department. The CCD backbone running parallel to the I-70 Mainline shall cross the I-70 Mainline at only one location within the Site, or as Approved by the Department;

ii. Conduits shall be installed by the Developer per the National Electrical Code (NEC) requirements including separate conduits and pull boxes for power, communications and appropriate conduit fill ratio. Power conduits shall be placed above Zayo conduits if they are located in a joint trench;

iii. Permanent CDOT ramp meters, CCD traffic signals and traffic signal surveillance cameras shall be designed and connected to the respective agency fiber backbones by the Developer;

iv. The Developer shall maintain existing ramp metering connections and communications to the central ramp metering control system;

v. Location markers for fiber optic and power shall be installed by the Developer as per the Project Special Provisions, Appendix A of this Section 3;

vi. Fiber strand color codes and conduit color codes shall follow CDOT's, Zayo's and CCD's requirements;

vii. The Developer shall be responsible to install the number of conduits in a duct bank, as described below. The fiber and conduit installed are for Zayo's, CCD's and CDOT's exclusive use and may not be used for fiber laterals or power;

viii. CDOT's duct bank consists of five 2-inch conduits along I-70 Mainline between Airport Blvd. and the pull box west of I-25; one of the 2-inch conduits is for CDOT's backbone and the other four 2-inch conduits are spare for CDOT's future use and not to be used on this Project. Any conduits needed for ITS or ETC fiber laterals or power shall be installed in addition to CDOT's five 2-inch conduits;

ix. All references to conduits in this Section 3 shall be either polyvinyl chloride (PVC) schedule 80 or high-density polyethylene (HDPE) schedule 80 and ETL/UL listed. The conduits shall be factory lubricated, low friction, high-density conduit constructed of virgin schedule 80. HDPE conduits shall be capable of being coiled on reels in continuous lengths, transported, stored outdoors, and subsequently uncoiled for installation, without affecting its properties or performance. All conduits shall comply with the CDOT Standard Specifications;

x. The following are additional requirements for the conduit, fiber and power installation:

A. Separate 2-inch lateral conduits for fiber laterals shall be required to the ETC and ITS equipment. These shall be in addition to the five 2-inch conduits for CDOT;

B. Separate 12 strand single mode fiber optic lateral cables shall be required to the ETC and ITS equipment;

C. 3-inch lateral conduit and fiber shall be required to CCD signals and equipment per Schedule 10, Section 11 Signing, Pavement Markings, Signalization and Lighting;

D. Separate power conduit, 2-inch minimum, shall be required to the equipment for ETC, ITS, and CCD. These shall be in addition to the five 2-inch conduits for CDOT;

E. The Developer shall design electrical Utility service as described in Schedule 10, Section 4 Utilities;

F. CDOT and Zayo require manholes for backbone conduits. Pull boxes will not be allowed for CDOT or Zayo backbone conduits. See the Pull Boxes and Manholes section in this Section 3 for spacing requirements;

G. CCD requires pull boxes for their backbone conduits. Refer to the Pull Boxes and Manholes section in this Section 3 for spacing requirements;

H. The Developer shall replace all impacted existing CCD fiber lateral or backbone cables. No new end-to-end splice points for CCD backbone or lateral cables shall be introduced, unless Approved by the Department. Existing fiber slack in existing CCD pull boxes, manholes or cabinets cannot be utilized in order to re-use existing fiber;

I. Fiberglass sweeps are not allowed unless otherwise Approved by the Department;

J. The Developer shall splice all laterals to the backbone;

K. The Developer shall be responsible for the removal of all existing fiber backbone and lateral cables that are replaced;

L. The Developer shall audit and verify all existing splice closures and available fibers on the existing shared resource prior to any work to re-locate existing ITS devices;

M. End-to-end fiber backbone splices for CDOT's fiber backbone shall be spaced no closer than 20,000 feet apart and locations shall be Approved by the Department prior to notifying Zayo of the cable reel lengths to procure;

N. CCD backbone and Zayo 288 strand fiber cables shall be installed continuously, with no intermediate end-to-end splice points allowed, unless approved by CCD or Zayo respectively;

O. If the conduit duct bank is installed under proposed or existing live traffic, a concrete (Class BZ) encased trench to the bottom of the pavement structural section is required;

P. At all locations where Zayo's, CDOT's and CCD's conduits are installed in one trench, Zayo's conduits shall be placed on the bottom; and

Q. If conduit and fiber require crossing bridge structures, the Developer shall comply with the relevant requirements of Schedule 10, Section 13 Structures.

xi. Except as specified otherwise, the following sets out the Construction Work that shall be the Developer's responsibility in relation to the conduit duct bank and fiber:

A. I-70 between Quebec St. and Airport Blvd.;

(I) The Developer shall furnish and install five 2-inch conduits for CDOT, comprised of 4 spare conduits and one conduit for the CDOT backbone, along the I-70 Mainline, which shall terminate in the new node building at I-70/ Airport Blvd.;

(II) If the CDOT five 2-inch conduits are installed on the south side of the I-70 Mainline, they shall be placed in the ROW, and within 5 feet of the existing or proposed Zayo conduits;

(III) The Developer shall install the 216 strand single mode fiber optic cable, provided by Zayo, in one 2-inch conduit for the CDOT backbone;

(IV) For lateral from the new node building at I-70/Airport Blvd. to the KOA communications room the Developer shall utilize new conduit and existing Zayo conduit as follows:

(aa) Provide and terminate a new 24 strand single mode fiber optic cable lateral from the node building at I-70/Airport Blvd. to the KOA communications room;

(bb) Install a 2-inch conduit from the new node building at I-70/Airport Blvd. to Zayo's shared resource manhole at I-70 and 32nd Pl.;

(cc) Provide a manhole for CDOT's splice location at I-70/Airport Blvd. next to Zayo's facility;

(dd) Utilize an existing empty 1 ¼-inch innerduct in the Zayo facility from I-70 and 32nd Place to Colfax Ave and Tower Road. See Schedule 29 Reference Documents; and

(ee) Install a 2-inch conduit from Zayo's network at Colfax Ave and Tower Road to the KOA communications room. The path shall be Approved by the Department.

(V) The Developer shall relocate existing CCD conduit and fiber backbone if impacted. Refer to CCD Fiber Interconnect in the Reference Documents; and

(VI) If the existing Zayo facility is impacted, refer to Schedule 10, Section 4 Utilities.

B. I-70 between York St. and Quebec St.

(I) As described below, the Developer shall install twelve conduits in a duct bank also referred to as the joint trench. Twelve conduits shall be stacked in a trench that shall be no more than 22-inches in width, except as Approved by the Department. The twelve conduits are as follows:

(aa) Six 6-inch conduits with two of the 6-inch conduits equipped with seven 1 ¼ -inch innerducts for Zayo. These conduits are inclusive of Zayo's 288-strand fiber optic cable which includes 36 strands of fiber allocated to CDOT and are a shared resource between Zayo and CDOT. An agreement between Zayo and CDOT allows for this 36 strands of fiber to extend through the entire length of the conduit;

(bb) One 2-inch conduit for CCD's 96 strand fiber optic cable (CCD's backbone); and

(cc) Five 2-inch conduits for CDOT, comprised of 4 spare conduits and one conduit for the CDOT backbone.

(II) The Developer shall install Zayo's 288 strand fiber which will be spliced by Zayo;

(III) The Developer shall install CCD's 96 strand fiber (84 strand single mode and 12 strand multi-mode) backbone provided by Zayo. The Developer shall splice CCD's 96 strand fiber to existing 48 strand fiber in ITS pull boxes at Quebec St and Washington St.;

(IV) Between Colorado Blvd and Quebec St., the Developer shall furnish and install an additional 2-inch conduit for CCD and an additional 96-strand fiber cable (84 strand single mode and 12 strand multi-mode) backbone;

(V) The Developer shall install CDOT's 216 strand fiber optic cable provided by Zayo in one 2-inch conduit for the CDOT backbone;

(VI) The location of the joint trench shall be submitted to the Department for Approval. The location shall have safe, easy access for maintenance without the need for road closures or detours; and

(VII) At Holly St and Stapleton Dr S, northwest quadrant, the Developer shall maintain the existing conduit and fiber lateral to the CDOT North Holly building at 4670 Holly St.

C. I-70 between Washington St. and York St.

(I) The Developer shall install CDOT's five 2-inch conduits, comprised of 4 spare conduits and one conduit for the CDOT backbone, and CCD's one 2-inch conduit along the I-70 Mainline. The location shall be submitted to the Department for Approval; and

(II) The Developer shall install the 216 strand single mode fiber optic cable, provided by Zayo, in one 2-inch conduit for CDOT's backbone and a 96 stand fiber optic cable in one 2-inch conduit for CCD (84 strand single mode and 12 strand multi-mode) for CCD's backbone, provided by Zayo.

D. I-70 between West of I-25 and Washington St.

(I) Between Washington St and existing CDOT ITS manhole west of I-25 (Station 1001+-00 164 feet right), the Developer shall install CDOT's five 2-inch conduits, comprised of 4 spare conduits and one conduit for the CDOT backbone, along the I-70 Mainline. The location shall be submitted to the Department for Approval; and

(II) The Developer shall install the 216 strand single mode fiber optic cable, provided by Zayo, in one 2-inch conduit for CDOT's backbone.

xii. The following sets out the Construction Work that is the Developer's responsibility in relation to the node buildings. The communications node building, regeneration node building, and traffic management system building are used interchangeably, but as per the Project Special Provisions, Appendix A to this Section 3 all refer to the same facility that houses communication equipment which aggregates transmissions from ITS and ETC field devices.

A. Node building at I-70/Airport Blvd.;

(I) The Developer shall be responsible for the design and construction of a new node building at I-70/Airport, see Appendix A to this Section 3, Revision of Section 614 – Traffic

Management System Building. The location and access of node building shall be submitted to the Department for Approval. The location shall have safe, easy access for maintenance without the need for traffic control;

(II) The entire node building shall have modular UPS and shall include installing an external natural gas generator. This includes all wiring and connections to an automatic transfer switch at the node building;

(III) Minimum node building size shall be per Appendix A to this Section 3, Revision of Section 614 – Traffic Management System Building. The node building footprint shall allow for future UPS installation of equal size and capacity;

(IV) The node building shall include an asphalt driveway to building and asphalt parking area to accommodate two vehicles;

(V) Node building site shall be graded to ensure surface water flows away from building and parking area;

(VI) Developer shall provide chain link fencing for security that surrounds the node building and asphalt parking area. Fencing shall be double gated at driveway and width to allow for two vehicles to pass;

(VII) Developer shall provide equipment racks for ITS and ETC equipment. ETC equipment racks shall be separate from ITS equipment racks and shall be lockable for individual secured access;

(VIII) Developer shall provide power distribution units (PDUs) for each rack and cabinet that provide safe and efficient power distribution to house equipment;

(IX) Developer shall provide horizontal and vertical cable pathways with the node building for proper installation of copper and fiber cables;

(X) Developer shall provide three phase, 120/208 volt power service (from the Utility meter), to the node building with generator, automatic transfer switch, and UPS backup;

(XI) The Developer is required to provide a packetwave platform switch, an Ethernet-over-dense wavelength division multiplexing (DWDM) packet-optical platform unit, coarse wavelength division multiplexing (CWDM) mounting panels, modules and aggregation switches, and ETC and ITS equipment for CWDM Ethernet communications, as described in the Project Special Provisions, Appendix A to this Section 3; and

(XII) The Developer shall provide design and optical fiber network connections for the ETC and ITS devices.

B. Node 1 at I-25 and 38th Ave./Fox St.;

(I) From the existing CDOT ITS manhole west of I-25 (Station 1001+00 offset 164 feet right), the Developer shall install CDOT's 216 fiber backbone through CDOT ITS existing conduit to Node 1. The existing conduit is located within the I-25 HOV express lanes and the Developer shall coordinate with HPTE for lane closures and work. Allowable work periods defined by

HPTE are between 7:00 pm Friday and 5:00 am Sunday. Any closure of such lanes (including within the allowable work periods) will require Developer to reimburse HPTE for lost daily toll revenues. The amount of any such reimbursement will be in an amount equal to the revenues payable by HPTE in such circumstances to the concessionaire pursuant to the terms of HPTE's P3 concession agreement in relation to the US36 and I-25 Managed Lanes Project.

(II) The Developer shall connect designated ETC fibers and the Cover network equipment room fibers from the 216 strand single mode fiber optic cable, CDOT's backbone, to Node 2 by splicing through at Node 1 and utilizing CDOT's existing backbone on I-25;

(III) The Developer may utilize the existing equipment rack for termination work;

(IV) The Developer shall provide a rack-mount splice/termination panel and splice/terminate CDOT's 216 strand single mode fiber optic cable. All strands of CDOT's new backbone fiber cable shall be terminated with LC type connectors; and

(V) The Developer shall conduct all CDOT fiber optic backbone cable cross connects or splicing as it pertains to the overall network design in Node 1. These cross connects shall include but are not limited to connections to CTMC, Southmoor Node, Node 2, the new node at I-70/Airport Blvd., the network equipment room at the Cover and the E-470 Authority at E470 /6th Ave. Additional cross connects to splicing may be required to complete the system.

C. Node 2 at I-25 and 70th Ave.;

The Developer shall connect the new ETC network field elements to the existing ETC equipment at Node 2 by using the existing available fiber from Node 1 to Node 2.

D. KOA Communications Room at Colfax and Tower;

The Developer shall provide a rack-mount fiber optic splice/termination panel for the fiber lateral between the Airport Node and the KOA communications room. The Developer shall be responsible for terminating or splicing all fibers, on both ends.

E. Southmoor Node at I-25; and

The Developer shall provide CWDM mounting panels, modules and aggregation switches, and ETC and ITS equipment for CWDM Ethernet communications, as described in the Project Special Provisions, Appendix A to this Section 3.

F. Cover Network Equipment Room.

The Developer shall provide CWDM mounting panels, modules and aggregation switches necessary for CWDM Ethernet communications, as described in the Project Special Provisions, Appendix A to this Section 3, to meet the requirements of Schedule 10, Section 12. The Developer shall provide a minimum of 2 rack units of rack space and connections for the CDOT provided firewall.

b. Construction Requirements

i. Utilities shall not be permitted in the joint trench and shall not be permitted within 4 feet on either side of the joint trench. Wet Utilities are not allowed above or below the conduit duct bank except for crossings. The conduit duct bank shall be no more than 22-inches wide, and provide 4 feet of cover, plus the surface thickness of the pavement or sidewalk, measured from the top of the conduit. Conduit duct bank shall be no deeper than 6 feet. Cover and placement requirements for utilities, conduit, and duct bank shall be followed or as Approved by the Department;

ii. Any interference between other conduits, drainage pipes and outlets shall be mitigated. The fiber conduits perpendicular to any drainage outlets shall be cast in concrete (Class BZ) to prevent it from floating upward to the surface. A design by the Developer shall be submitted for Acceptance if at least a 48-inch depth from the top of the conduit trench to the surface cast in concrete (Class BZ) cannot be accommodated. For bores that contain more than one conduit, the conduit shall be bundled together and contained in a single bore;

iii. Aerial fiber optic cable is not allowed for temporary or permanent installation;

iv. The Developer shall install conduit plugs in all open conduit ends immediately following conduit installation. Pull tape shall be installed in all conduits and tracer wire shall be installed in every conduit that contains fiber and every run of conduit shall have at least one tracer wire in the bundle. The conduit shall not be considered complete until the conduit plugs, pull tape, tracer wire have been installed, and all requirements in Appendix A to this Section 3, Revision of Section 613 – CDOT Electrical Conduit have been met;

v. The Developer shall be responsible to protect all fiber cables that are the Developer's responsibility to install. If there is damage to any new fiber optic cables, either lateral or backbone, the Developer shall be responsible for replacing the cable between Approved end-to-end fiber backbone cable splice points;

vi. The Developer shall be responsible for clearing and grading of the node building site to accommodate the new node location and associated appurtenances. Obtaining any Permits required by the State and/or any other Governmental Authority shall be the responsibility of the Developer, including the preparation of any applications and payment of accompanying fees. The Developer shall also be responsible for coordinating with Utility Owners to provide essential services at the node location; and

vii. Developer shall become a member of the applicable notification association (as defined in CRS 9-1.5) for all Developer installed fiber per Schedule 18. The Developer shall be responsible for locating all Developer installed fiber facilities, whether or not they are spliced, until the end of the O&M Work with respect to ITS and ETC facilities per Schedule 11.

3.8.7. Electrical Power

a. Design Requirements

i. The Developer shall provide single phase 120/240 volt alternating current (AC) power service to every ITS and ETC cabinet within the Site. Refer to Schedule 10, Section 11 for Ramp Metering power requirements. Each power service includes meter(s), metered service, power disconnect at the service, and additional external power disconnect on the cabinet. All power service work shall be designed within the ROW. The proposed node building at I-70/Airport Blvd. has separate power requirements defined in this Section 3 and the single phase AC does not apply;

ii. Economizing the power services for multiple sites with similar equipment into one meter is allowed. However, ETC equipment, ITS, and ramp meters each require separate dedicated meters for billing purposes. Separate disconnect means are required for each individual device which serves as a maintenance breaker to avoid power shutdowns for an entire site;

iii. Any remaining existing services shall be metered, if not already, and include a power disconnect;

iv. The Developer shall obtain approval for all power service designs or modifications from the power service provider. The Developer shall coordinate and meet all requirements, as specified by the power service provider, for the complete and operational power service to all required locations;

v. The Developer shall be responsible for the coordination of Utility service as described in Schedule 10, Section 4 Utilities; and

vi. The Developer shall size the power service and electrical conductors to accommodate the Ultimate design for the two-lane toll points and an additional LUS.

b. Construction Requirements

i. The Developer shall make appropriate arrangements with the power service provider for installation or relocation of power service. The Developer shall also be responsible for all costs of installing or relocating Utility services, including involvement with the power service provider at locations for new services. The Developer shall ensure the transition and reassignment of electrical service to under CDOT's account and that there is no disruption in service; and

ii. Developer shall become a member of the applicable notification association (as defined in CRS 9-1.5) for all ITS and ETC electrical power services per Schedule 18. The Developer shall be responsible for locating these facilities until the end of the O&M Work with respect to ITS and ETC facilities per Schedule 11.

3.8.8. Location, Protection of ITS and ETC Systems and Worker Safety

a. Design Requirements

i. The Developer shall design all ITS and ETC infrastructure, in accordance with this Section 3, to ensure equipment and devices can be installed within the ROW, and Routine Maintenance operations can be performed without lane Closures, affect traffic operations, or require complex traffic control. Overhead LUS's and TTI antenna are an exception. All proposed locations shall require Approval by the Department prior to installation;

ii. All existing underground Utilities, within ROW, and all ITS and ETC infrastructure Elements shall be designed to avoid or minimize conflicts with these facilities. Existing and new Utilities shall be shown on the plans. The Developer shall be responsible for all repairs to facilities damaged during construction. The Developer shall be responsible for maintaining and keeping operational all existing ITS devices, infrastructure, power and communications during construction per the Project Special Provisions, Appendix A to this Section 3. This includes CCTV cameras, DMS, Doppler radar, MVRD, TTI, RWIS, ATR, ramp metering, communications and network equipment, and other devices owned by CDOT and the CCD;

iii. The Developer shall protect all new equipment, devices, interconnect wiring, communications devices, communications lines, power supplies, antennas, operator controls, power service, etc. through the installation of an on-line double-conversion power conditioner to eliminate damage by external and internal sources (including power surges), lightning, induced voltages, and static

discharge. A grounding system and protection of devices that are suitable for the specific installation and equipment shall be designed. See Project Special Provisions, Appendix A to this Section 3 for Grounding and Bonding Specification;

iv. Structure cross sections are required for all ETC and ITS equipment structures and shall incorporate Elements from this Section 3 and Schedule 10, Section 11 Signing, Pavement Markings, Signalization, and Lighting. ITS pole and tower cross sections are also required for all CCTV, MVRD, TTI, DSRC, RWIS and friction sensors. Cross sections shall also be provided for ramp metering equipment and ground mounted cabinets. All ETC and ITS devices, equipment, external conduit, penetrations, and cabinets to be mounted on the sign structures and poles shall be shown on these cross sections. Cross sections for each sign structure with ETC and ITS equipment shall be submitted for Approval by the Department prior to structure design;

v. Profile plans for any LUS, SMVMS, DMS, or VTMS structures showing the sight distances for each sign shall be submitted for Approval by the Department;

vi. Location specific, device orientation details, are required for all ITS device locations showing the orientation in relation to the roadway of each device, cabinet and access handhole to be installed on the pole or structure; and

vii. Design for all ITS and ETC infrastructure shall account for Routine Maintenance operations. All Routine Maintenance operations shall be accessible by public ROW. Access through any fenced ROW area shall include the installation of double gates that can be locked. The location of ITS and ETC infrastructure shall have safe, easy access for maintenance without the need for road closures or detours. Safe vehicle access shall include ingress and egress relative to deceleration and acceleration. Consideration needs to be given to any structures that impede these movements, along with the required distances for the individual movements. All proposed locations shall require Approval by the Department prior to installation. The following are maintenance requirements for ITS and ETC Elements:

A. Pull boxes and Manholes

(I) Pull boxes, manholes, and respective aprons shall be installed on level ground. A working surface shall extend a minimum of 5 feet beyond the pull box or manhole concrete apron and have a slope of 1:5 or flatter. The working surface shall be designed by the Developer and Accepted by the Department.

(II) Pull boxes and manholes must be directly accessible by maintenance trucks or have parking within 1,000 feet and direct maintenance pedestrian access (1:4 slope or flatter) to the pull box or manhole, unless otherwise Approved by the Department. Splice points must be accessible by maintenance truck within 10 feet.

B. Cabinets

(I) Cabinets shall be installed on level ground. A working surface shall extend a minimum of 20 feet parallel to the roadway and 10 feet perpendicular to the roadway beyond the concrete base. The working surface shall have a slope of 1:5 or flatter. The working surface shall be designed by the Developer and Accepted by the Department.

(II) Cabinets must be directly accessible by maintenance trucks or have parking within 1,000 feet and direct maintenance

pedestrian access (1:4 slope or flatter) to the pull box or manhole, unless otherwise Approved by the Department.

(III) Cabinets shall be located such that maintenance will not require a lane closure.

(IV) Cabinets shall not be placed in the median from Quebec St. to Tower Rd. and shall be located such that maintenance will not require a lane or shoulder closure, unless otherwise Approved by the Department.

C. ITS and ETC Devices

(I) Poles and structures with ITS or ETC equipment shall be installed at a location on level ground. A working surface shall extend a minimum of 20 feet parallel to the roadway and 10 feet perpendicular to the roadway. The working surface shall have a slope of 1:5 or flatter, or as Approved by the Department. The working surface shall be designed by the Developer and Accepted by the Department.

(II) Poles and structures must be directly accessible by maintenance trucks or have parking within 1,000 feet and direct maintenance pedestrian access (1:4 slope or flatter) to the pole or structure, unless otherwise Approved by the Department.

(III) The CCTV camera sites shall be designed such that the camera can be lowered to the ground for maintenance purposes without interfering with any other pole mounted devices or cabinets, and is directly accessible by the person lowering the camera. The positioning of the CCTV's mating/locking device shall be installed such that it does not interfere with the camera view.

(IV) TTI antennas shall be accessible by CDOT bucket trucks and unit replacement shall be feasible within 15 minutes.

(V) MVRD units shall not be located in the median. The MVRD units shall be located such that maintenance will not require a lane closure.

(VI) For DMS an 8 feet wide paved area shall be provided, outside of the shoulder for maintenance access, where ROW permits. The sign bridge shall have a locked, secured ladder and walkway so that maintenance personnel can maintain every portion of the sign bridge without the use of a bucket truck.

(VII) From Quebec St. to Tower Rd., ITS and ETC devices, cabinets and other Elements shall not be located in the I-70 Mainline median, except for the center support of freeway DMS, VTMS, and TTI related to the Tolled Express Lanes, AVI, ALPR, transaction status indicator beacons and the support structures.

b. Construction Requirements

i. The Developer shall be responsible for locating all underground facilities to avoid or minimize conflicts with these facilities. If any facilities are damaged during construction, the Developer shall be responsible for all repairs;

ii. The Developer shall construct a grounding system for each ITS and ETC device;

iii. ITS devices are integral to CDOT's overall traffic operations. Communications and disruptions of ITS devices during construction shall be kept to a minimum time period. Developer shall provide a Maintenance of ITS Plan to be Accepted

by the Department at least 30 Calendar Days prior to start of disruption of communications or device outages in the area. The Maintenance of ITS Plan shall outline all devices, highlighting the devices impacted due to reset, removal, replacement and also show any new devices. The plan shall include a method statement and details on how fiber communications and operability will be maintained for each device during construction, including the anticipated workforces to provide the maintenance. ITS plan sheets shall be provided for all temporary work and shall be considered a design deliverable per Schedule 8. The plan shall also include scheduled start and end dates of impact, duration and justification. Dates shall reflect actual end and start dates where each device is fully operational and communicating with the CTMC. CDOT's and CCD's respective fiber optic backbones cannot be out of service unless Approved by the Department and CCD;

iv. If ITS devices require reconnecting to existing backbone due to Construction Work, Zayo is required to provide this service. Zayo will require advance notification of work as specified in this Section 3 and fee assessed by Zayo shall be at the expense of the Developer; and

v. Developer may need to reset existing CCD ITS devices, including fiber optic cable communications to maintain CCD's operations.

3.8.9. Communications System

a. Design Requirements

i. The communications system is used to transmit data to and from all existing and proposed ITS devices. In addition, the ETC system used for transmitting all ETC tolling data to and from the back-office for processing, issuing of tolls, and updating of information in the lanes;

ii. Refer to Schedule 10, Section 12 Cover MEP System for other requirements that need to be integrated into the system regarding command control and monitoring of the systems inside the Cover. The Developer shall design and construct any infrastructure and systems required to provide cell coverage to Users in the Cover;

iii. The Developer shall design the lateral fiber optic communication system from CDOT's communications backbone to the field devices and end equipment which includes the node buildings listed in this Section 3. CDOT uses CWDM and DWDM technology for all optical Ethernet communications, with the exception of the ETC toll point equipment. The ETC toll point equipment lateral splices to the backbone shall utilize standard optics. Standard optics shall be defined as those operating within the O-band transmission window (notably 1310 nm). The CWDM and DWDM technology includes the use of CWDM filters spliced to the device lateral fiber optic cable in the backbone manhole. CWDM optical multiplexers/demultiplexers in the node buildings and CWDM optics in both the field Ethernet switches and the node building aggregation and packet-optical platform. DWDM technology is used as part of CDOT's high-speed optical Ethernet backbone, a DWDM packet-optical platform is required in the new I-70/Airport Blvd. node building;

iv. CDOT's fiber backbone will be economized to the degree that four buffer tubes are used for CDOT, one buffer tube for ETC equipment, and the remaining buffer tubes will be preserved and uncut for future use by CDOT. All strands of CDOT's new backbone fiber cable shall be terminated with LC type connectors or spliced through in the new I-70/Airport Blvd. node building and the Node 1 building. Construction Work should be expected in Node 1, Node 2, Southmoor Node, the new node at I-70/Airport Blvd., the KOA communications room and the CTMC. If additional buffer tubes are required, the Developer shall provide an explanation

and will need Acceptance from the Department. The network drawings shall economize the fiber splices using CWDM technology. The DWDM and CWDM Project communications requirements shall include the design of equipment to connect between the Southmoor Node and the new node at I-70/Airport Blvd. The Developer shall design a system capable of transporting data and video signals between field devices and support the following functional requirements, at a minimum:

A. Provide CDOT fiber optic communications connectivity between the field devices, end equipment, the new node at I-70/Airport Blvd. and Southmoor Node;

B. Splice up to twelve fibers from the I-70 backbone cable to twelve of CDOT's strands of the Level 3 fiber cable at the existing I-70 and I-225 manhole to connect to the Southmoor Node building to provide a redundant ring for the I-70 Mainline device communications. The twelve fibers on I-70 and on I-225 shall need to be optical time-domain reflectometer tested for dB loss. The range of acceptable loss can be found in the Project Special Provisions, Appendix A to this Section 3;

C. Provide CWDM internet protocol (IP) Ethernet communications to all field Ethernet switches. All devices shall be IP compatible and connected to the field Ethernet switches. A single CWDM Ethernet switch shall be installed at a location with either a single device or multiple devices. If the Ethernet port density is insufficient, a second Ethernet switch shall be installed at that location. No optical fiber extenders of any type shall be allowed. Each individual device Ethernet cabling shall plug into a CWDM Ethernet switch at its installed location;

D. Support full-color, real-time video images at a data rate of no less than four MB/s or at the Department standard at the time of construction of the CCTV camera system for all cameras to node building;

E. All fiber allocations, splicing diagrams, and network drawings shall be prepared by the Developer and submitted to the Department for Approval in electronic format; and

F. Splicing of CDOT fiber optic cable shall be performed in manholes only.

v. The Developer shall furnish all components required to achieve a fully-functioning communications system. The communications system shall be designed based on the following material requirements: Respective (Zayo, CDOT, CCD) fiber optic backbones and laterals shall include sweeps (conduit breakouts) to separate pull boxes, manholes, or vaults, as required, for each owner, and respective ownership clearly marked on each Element;

vi. CCD's fiber backbone shall utilize standard optics;

vii. Provide separate 12 strand fiber optic cable (minimum 6 single mode, 6 multi-mode) laterals and conduit from the CCD backbone to all traffic signals. Replacements to match existing fiber optic cable. Reference CCD standards for fiber optic specifications and standards for equipment, installation and communication connections;

viii. For CDOT, 100 feet of each fiber optic cable shall be coiled inside each manhole, and 50 feet of each fiber optic cable shall be coiled inside each pull box. An additional 100 feet of 12 strand fiber shall be coiled at all splice locations for CWDM splicing. The coiling lengths required shall be for the final configuration, after splicing has occurred;

ix. For CCD, one hundred feet of each fiber optic cable shall be coiled at each splice location and 50 feet of each fiber optic cable shall be coiled at non-splicing locations. The coiling lengths required shall be for the final configuration, after splicing has occurred;

x. At splice locations, the fiber optic cable coil length shall be evenly distributed on each side of the splice closure;

xi. CDOT lateral splices to the fiber optic backbone shall be spaced no closer than ½ mile apart. To alleviate an excessive number of fiber laterals spliced in a single manhole, all device laterals shall be evenly distributed between splice manholes and there shall be a maximum of 3 CWDM switches spliced in a manhole, unless otherwise Approved by the Department. Each switch shall have its own separate fiber lateral to the fiber backbone splice manhole and a maximum of 2 switches per wavelength (not per lateral). Other non-CWDM laterals may be permissible in the same manhole;

xii. Provide fiber quick disconnects at all unprotected ITS devices and equipment locations where new fiber optic lateral cables are installed and spliced to CDOT's and CCD's backbone cables. The fiber quick disconnects shall allow the fiber laterals to be disconnected to prevent damage to the fiber backbone in case any of the devices or equipment along the corridor are damaged. The fiber quick disconnect shall be installed in areas where they will not be submerged in water and per the manufacturer's recommendations. Bend insensitive (ITU-T G.657 A) tactical fiber optic cable with a polyurethane jacket shall be used for all patch cables and shall be fully compatible with all fiber optic laterals;

xiii. Provide hardened, extended temperature roadside carrier grade field Ethernet switches configured per the Project Special Provisions, Appendix A to this Section 3. The switches shall also include sufficiently sized optics and attenuators for transmitting and receiving data from the node building aggregation Ethernet switches. Per the Project Special Provisions, Appendix A to this Section 3. Ciena 3930 or 3931 switches are required at CDOT ITS device locations throughout the Project corridor;

xiv. All existing and proposed ITS and ETC field devices to be connected to the fiber optic backbone shall communicate via Ethernet switches, unless otherwise stated;

xv. CWDM wavelengths for both the Ethernet switch optics and optical CWDM filter shall be 1430 NM, 1450NM, 1470NM, 1490NM, 1510NM, 1530NM, 1550NM, 1570NM, 1590NM and 1610NM;

xvi. DWDM technology shall be used for backbone connectivity between packet-optical platform switches. DWDM ranges for the DWDM packet-optical platform unit can be found in Project Special Provisions, Appendix A to this Section 3;

xvii. 1430 NM, 1450 NM, 1470 NM, 1490 NM, 1510 NM, 1530 NM, 1550 NM 1570 NM, 1590 NM, and 1610 NM SFPs shall be used as the CWDM transport mode and 1310 NM SFPs shall be used as the resilient path transport. Ethernet switches will be used to transport CDOT field device data to minimize fiber usage and maximize fault tolerance;

xviii. All roadside carrier grade field Ethernet switches shall be fully compatible with the DWDM packet-optical platform unit and aggregation switches;

xix. Passive CWDM thin film filter multiplexer (MUX) shall be used at each roadside field Ethernet switch splice location to split out the appropriate wavelengths. The MUX filters and MUX filter splices shall be contained in a separate splice enclosure from the splice enclosure containing the lateral fiber cable to backbone fiber cable splices;

xx. Management system software tool shall be provided to manage carrier grade field Ethernet and Transport product portfolios;

xxi. Passive 1U rack mount 32-channel optical splitter shelf shall be used in the regeneration building to demux (split) CWDM optical signals out to the paired SFP in the core aggregation switch;

xxii. Provide one CWDM Optical Time Doman Reflectometer (OTDR) modular testing unit to test the CWDM optical networks prior to any CWDM filter splicing. The CWDM OTDR will become the property of CTMC after the Final Acceptance Date;

xxiii. Optical attenuators shall be installed on all receive signals entering the field fiber optic termination patch panels to ensure the optical power is within the acceptable range for the selected optic. The receive signal shall be tested both prior to and after the attenuator is installed;

xxiv. Optical attenuators shall be installed on all received signals entering node buildings multiplexer/demultiplexer receive ports to ensure the optical power is within the acceptable range of the selected optic. The receive signal shall be tested both prior to and after the attenuator is installed; and

xxv. The Developer shall submit network and splicing plans for Approval by the Department. The network and splicing plans shall include network drawings, fiber allocations, and splicing diagrams.

b. Construction Requirements

i. The Developer shall furnish and install the fiber optic communications system and connect all ITS, ETC and CCD field Elements to the system;

ii. Prior to performing any Construction Work that may impact existing ITS communications systems, the Developer shall coordinate with the owner of the affected system;

iii. Fiber optic conduit shall be located along 46th Ave. under the sidewalk. It shall not be located in the travel way unless Approved by the Department;

iv. The Developer shall provide fiber test results for Acceptance by the Department. The results shall include OTDR fiber cable trace results, power meter results, spectrum analyzer results including both pre-attenuator and post attenuator installations; and

v. CWDM technology shall be used for CDOT's ITS optical Ethernet communications which shall include CWDM SFP optic modules in both the field switches and the node building aggregation switches, CWDM thin filters at all CWDM splice locations and the multiplexer/demultiplexer installed in the node buildings. The Developer shall design up to 20 CWDM Ethernet switches on a pair of fiber strands to ensure fiber utilization, with two switches allowed per wavelength. The Developer shall request Approval from the Department if there are cases where more than two switches per wavelength or 20 per pair of fiber strands are needed.

3.8.10. Vertical Clearance Requirements

Design Requirements

See Schedule 10, Section 11 Signing, Pavement Markings, Signalization, and Lighting for vertical clearance requirements, provided that all AVIs shall have an 18.5 feet clearance from the roadway surface. If any signage/signals or tolling equipment are planned on structures the vertical clearance is measured to the bottom of the lowest device and any future equipment from the highest point on the roadway surface under the device. Therefore, sign panels and structures

must accommodate the additional clearance required for the proposed and future ITS and ETC devices.

3.8.11. Dynamic Message Signs

a. Design Requirements

i. The DMS's are large dynamic displays that are used for a wide range of purposes, including providing driver information regarding weather advisories, travel times, amber alerts, toll information, construction, and incident notifications. The Developer shall design a complete DMS system. Final sign locations may need to be adjusted due to roadway geometry, conflicts with other signs or Cover requirements. Final locations of all DMS shall be Approved by the Department.

A. Westbound full color DMS shall be installed at the following approximate locations:

(I) 0.4 miles east of Airport Blvd.

(II) 0.5 miles west of Peoria St.

(III) Between Havana St. and in advance of the I-270 off ramp

(IV) 0.8 miles east of Colorado Blvd.

B. Eastbound full color DMS shall be installed (or, in the case of (ii), replaced) at the following approximate locations:

(I) Between I-25 and Brighton Blvd.

(II) In advance of Washington St. (at the same location as the current DMS). This DMS shall be over the entering ramp lanes

(III) Between the Cover and Vasquez Blvd.

(IV) 0.9 miles east of Colorado Blvd.

(V) Between the Central Park Blvd. eastbound on-ramp and Havana St.

C. A new Amber DMS with dimensions of 18 feet (width) by 8.5 feet (height) by 4 feet (depth) with an allowable variation of plus or minus 7-inches shall be installed at the I-70 eastbound to I-25 off-ramp to replace the existing DMS; and

D. See Schedule 10, Section 12 Cover MEP System for additional requirements regarding the DMS required for the Cover.

ii. New DMSs shall be mounted on a sign bridge and co-located with the static guide signs wherever possible. They shall be centered over the General Purpose Lanes but be visible to all Users. The DMS walkway shall be mesh with a maximum diameter of ½-inch to prevent dropped tools and debris from falling onto the travelled way. In addition, the walkway shall be Occupational Safety and Health Administration (OSHA) compliant with side rails and toe kicks. The Developer shall submit a structural design for each DMS structure in accordance with the requirements of Schedule 10, Section 13 Structures. The sign bridge walkway shall not prevent the static sign messages from being clearly read and shall be OSHA compliant; and

iii. The Developer shall furnish, install, integrate, and test all new DMS signs and any and all associated equipment necessary to achieve a fully-functioning system. The new DMS signs shall be designed based on the following material requirements, at a minimum:

A. The sign shall utilize light emitting diode (LED) displays;

B. The sign shall be equipped with the ability to display three lines of text with a character height of 18-inches and 18 characters minimum per line;

C. The sign shall utilize a full-color, full-matrix display and utilize a 24 bit red, green, blue color with a 32-35 mm pixel spacing (approximate size 26 feet width, 8.5 feet height by 4 feet depth with a tolerable variation of plus or minus 7-inches);

D. The sign shall have a walk-in cabinet;

E. The sign viewing angle shall be 30 degrees;

F. The sign shall have a minimum design life of 20 years;

G. The DMS controller and sign must be National Transportation Communications for ITS Protocol (NTCIP) compliant, provide an Ethernet interface, and must be compatible with the CTMS; and

H. The sign shall have environmental controls inside the cabinet and be capable of remote surveillance of all controls, legend and maintenance.

b. Construction Requirements

i. The Developer shall be fully responsible for the furnishing and installation of all DMS signs. Existing DMS on the I-70 Mainline may not be reused and shall be salvaged and returned to CDOT. The DMS shall be installed in accordance with manufacturer's recommendations. A qualified factory representative shall be available to ensure proper installation and testing; and

ii. Each DMS system shall be connected to the communication system using fiber optic laterals extended into the DMS controller cabinet. The Developer shall notify the Department upon installation of each DMS and complete, and submit to the Department for Acceptance, a CDOT Device Installation Checklist per Project Special Provisions, Appendix A to this Section 3. The Developer shall be responsible for local filed operations testing. The Department shall be responsible for modifying the CTMS software to incorporate the new devices.

3.8.12. Closed Circuit Television Camera

The CCTV cameras are used for monitoring travel conditions in the corridor, such as weather conditions, accidents, traffic congestion, and other events. The video images are also shared with the public via the internet (www.cotrip.org) and television news agencies.

a. Design Requirements

i. Provide full CCTV camera coverage of the entire I-70 corridor including all interchanges, between Pecos St. and Airport Blvd. CCD and RWIS cameras shall not be utilized to achieve this full coverage. The CCTVs shall be at a maximum of one mile separation, provide overlapping coverage up to 1,000 feet in full zoom, and provide ¼ mile coverage in either direction along roadways at interchanges. Due to the closely spaced bridges and Cover, additional cameras may be required for overlapping coverage;

ii. The CCTV camera coverage shall be provided via Ethernet-based cameras meeting the material requirements;

iii. The CCTV cameras shall be mounted on minimum of a 50 feet steel poles as described below and shall have a lowering device that allows CCTV cameras to be lowered to the ground;

iv. See Schedule 10, Section 12 Cover MEP System for additional requirements regarding CCTV camera coverage under the Cover;

v. All CDOT CCTV cameras installed shall meet the following minimum requirements:

A. Digital and Ethernet-based;

B. All-in-one color surveillance dome camera unit (Ingress Protection [IP] 66 and NEMA 4X rating);

C. Pan, 220 degree tilt, zoom operation;

D. 32X optical zoom and 12X digital zoom minimum;

E. Minimum illumination no less than 0.3 lux;

F. H.264 video stream or current standard used by CDOT at the time of installation;

G. Compatible with the current CCTV camera standard used by CDOT at the time of installation;

H. Full 360 degree overview with one-click pan, tilt, zoom; and

I. See Project Special Provisions, Appendix A to this Section 3.

vi. The CCTV camera shall also include a weatherproof dome housing, 50 feet, or higher, steel pole, proper foundation, lowering device, mount adapter, camera transformer, attachment hardware and all other hardware, cables, and test equipment necessary for a complete installation; and

vii. The Developer shall provide a CDOT CCTV coverage plan for CDOT cameras on the I-70 Project. The CDOT CCTV Coverage plan shall include the following items:

A. Plan view of CCTV coverage limits including radius of coverage for each camera;

B. Profile view of each direction of the roadway showing the CCTV coverage and calling out any potential occlusions, such as bridges and overhead sign structures;

C. A three-dimensional rendering, in MicroStation, for CCTV camera coverage between Colorado Blvd. and Washington St.; and

D. Photos of the CCTV view in each direction from a bucket truck survey, for all locations except between Colorado Blvd. and Washington St.

b. Construction Requirements

A. Existing CCTV cameras in the corridor may not be reused and shall be salvaged and returned to CDOT; and

B. The Developer shall notify the Department upon installation of each CCTV camera and complete, and submit to the Department for Acceptance, a CDOT Device Installation Checklist. The Developer shall be responsible for the integration of each new CCTV camera back to the CTMC. The Department shall be responsible for modifying the video control software to incorporate the new devices.

3.8.13. Microwave Vehicle Radar Detection

The MVRD, also referred to as side-fire radar, are used to collect point data of volume, occupancy, speed, and classification in each lane of travel. The data is used primarily for measuring and analysis of traffic conditions, both real-time and for studies.

a. Design Requirements

A. The Developer shall prepare a design to locate side-fire MVRD units at one half mile spacing both eastbound and westbound between Pecos St. and Tower Rd. In addition, the MVRD's shall be designed at 0.5 mile spacing from the exit gore ramp at I-225 northbound to westbound ramp and the exit gore ramp from I-25 northbound and southbound to eastbound I-70 both leading into the Tolled Express Lanes ingress points;

B. MVRD locations shall be coordinated such that they are at the desired location relative to the LUS, SMVMS, and DMS gantries to support the ATM system software algorithm (dynamic queue warning and lane control system); and

C. The Developer shall furnish all new MVRD units and any and all associated equipment necessary to achieve a fully-functioning system. The MVRD units shall detect all individual lanes of travel, including the General Purpose Lanes and Tolled Express Lanes in both directions. Data collection shall include volume, occupancy, speed, and classification.

b. Construction Requirements

The Developer shall furnish all MVRD and carry out all installation, field-testing, and burn-in of the system per the manufacturer's recommendations, the Construction Standards and Project Special Provisions, Appendix A to this Section 3. Each device shall be connected to the communication system using fiber optic laterals. Existing MVRD units may not be reused and shall be salvaged and returned to CDOT. The Developer shall notify the Department upon installation of each MVRD device and complete, and submit to the Department for Acceptance, a CDOT Device Installation Checklist.

3.8.14. Travel Time Indicators

TTI sites are comprised of antennas and readers that detect toll tag transponders in vehicles. While MVRD units give volume, occupancy, and speed data at a given point, the TTI are used to track vehicle travel times across segments spanning from one TTI location to the next.

a. Design Requirements

i. The Developer shall prepare a design to locate TTI sites in both directions between Pecos St. and Tower Rd. that shall read the General Purpose Lanes and the Tolled Express Lanes separately, without any cross-reading;

ii. For the General Purpose Lanes, the TTI sites shall be spaced with an approximate spacing of no more than one mile and shall be located before and after each interchange. Additional TTI sites shall be installed between the exit ramp and entrance ramp, at each interchange, to allow drivers exiting the facility for a short period of time to be excluded from the travel time calculations. The TTI sites shall be designed to read all General Purpose Lanes at each location, which may require multiple TTI antennas and/or readers. The TTI antennas shall be placed over the edge line of the lane or lanes in order to read all General Purpose Lanes;

iii. For the Tolled Express Lanes, TTI sites shall be located between each ingress/egress point in each direction of travel to obtain directional travel times;

iv. The TTI readers shall be Sirit 6204 multi-protocol readers and antennae, or CDOT's current model, and shall be able to read both Title 21 and ISO 18000-6C transponder tags. Any existing TTI sites along the new CDOT fiber optic backbone shall be replaced with new Sirit 6204 multi-protocol readers and antenna; and

v. TTI sites shall be located at least 1,000 feet from toll points.

b. Construction Requirements

The Developer shall furnish all new TTI readers, antennas and all associated equipment necessary to achieve a fully-functioning system. The Developer shall carry out all installation, field-testing, and burn-in of the system per the manufacturer's recommendations and the Construction Standards. Each device shall be connected to the communication system using fiber optic laterals. Existing TTI and associated equipment shall be salvaged and returned to CDOT. The Developer shall notify the Department upon installation of each TTI device and complete, and submit to the Department for Acceptance, a CDOT Device Installation Checklist.

3.8.15. Division of Transportation Development Automatic Traffic Recorders

The Division of Transportation (DTD) ATR stations continuously collect vehicle volume and functional classification data using in-pavement loops and piezoelectric sensors. The DTD ATR locations are to be placed between Holly St. and Dahlia St. and between Havana St. and Central Park Blvd.

a. Design Requirements

i. The Developer shall design the DTD ATR counting station. Each new DTD ATR must collect data for all lanes of travel, including the General Purpose Lanes, auxiliary Lanes, and Tolled Express Lanes in both directions. Communications to the DTD ATR station shall be provided via a 12 strand single mode fiber optic lateral from the ITS fiber backbone to a DTD ATR cabinet. In addition, a telephone line connection shall be provided for each counter. The ATR shall have a dual communications port, one for real time and one for historical reporting;

ii. The Developer shall furnish all equipment necessary to achieve a fully-functioning DTD ATR system. Each DTD ATR station consists of cabinet loop detectors and piezoelectric axle sensors (piezos), and traffic counters. The traffic counters are capable of classifying up to 8 lanes, so two traffic counters shall be required at each site so that vehicles in all lanes will be classified; and

iii. The Developer shall design a temporary ATR station while the existing permanent ATR station near Colorado Blvd. is out of service. The temporary ATR shall consist of an MVRD, cellular modem, pole mounted cabinet, and traffic counter.

b. Construction Requirements

The Developer shall furnish all DTD ATR-related equipment and carry out all installation, field-testing, and burn-in of all DTD ATR counting station being replaced. All Construction Work will be inspected by CDOT's Traffic Data Collection Unit (TDC) during installation for Approval. The Developer shall test and operate the piezos and loops under actual traffic conditions.

3.8.16. Doppler Radar

a. Design Requirements

The Doppler radar are a self-contained unit; including wireless communications. All existing units that need to be relocated shall be installed per the manufacturer's recommendations. All Doppler radar units shall be co-located with other sign structures and therefore shall not require separate structures to be installed by the Developer.

b. Construction Requirements

The Developer shall coordinate with the Department when any of the existing speed Doppler radar units currently installed along the corridor need to be relocated to new or temporary structures during construction.

3.8.17. Road Weather Information System and Environmental Friction Sensor

a. RWIS and friction sensors are used for traveler information systems and highway maintenance operations by providing on-Site weather information. RWIS and friction sensors shall include work and materials in Project Special Provisions, Appendix A to this Section 3, Revision of Section 614 - Weather Monitoring System (WMS) and Revision of Section 614 - Environmental Friction System.

b. Design Requirements

i. RWIS systems shall be installed as follows:

A. New RWIS shall be installed at the following locations:

(I) On I-70 eastbound at the east entrance to the Lowered Section, about 500-1,000 feet prior to the entrance;

(II) On I-70 westbound at the west entrance to the Lowered Section, about 500-1,000 feet prior to the entrance;

(III) On the Colorado Blvd. overpass in both directions of travel to monitor the road; and

(IV) On I-70 eastbound or westbound between the Havana Street and Peoria Street Interchanges.

B. Existing RWIS shall be salvaged and delivered to CDOT.

C. The existing RWIS system near Chambers Rd. and I-70 at approximately mile marker 283 shall require the roadway pucks to be replaced with non-invasive sensors and poles for mounting.

ii. The RWIS's shall include the following material requirements:

A. Weather monitoring system, including a remote processing unit, precipitation type sensor, air temperature/relative humidity sensor, ultrasonic wind sensor, non-invasive road surface sensor, non-invasive friction sensor, non-intrusive pavement condition sensor, and a CCTV camera; and

B. Concrete pad, fold-over tower, and chain link fence.

iii. Friction sensors shall be installed as follows:

A. Friction sensors shall be designed and installed on the I-70 Mainline and at all overpasses within the Site, including multiple overpasses within the interchanges at I-225, I-270 and I-25. Spacing shall be at a maximum of every 2 miles on I-70, in addition to overpasses on the roadway and ramps. Locations shall be Approved by the Department. The Developer

shall alternate the side of the road that the friction sensors are installed; and

B. A friction sensor shall only include the remote processing unit, air temperature/relative humidity sensor, ultrasonic wind sensor, non-intrusive pavement condition sensor, non-intrusive pavement temperature sensor, cabinet, mounting of sensor, and communications to CTMC. See Section 3 Appendix A, Revision of Section 614 -Weather Monitoring System, for the environmental friction sensor items.

c. Construction Requirements

The Developer shall be responsible for replacing any portions of the RWIS system impacted by the Construction Work and new installations. An existing RWIS is located at (a) I-70 and mile marker 276 (near SH 2), which shall be salvaged to the Department and replaced; and (b) I-70 and mile marker 283 (near Chambers Rd.), which will require existing pucks to be replaced with non-invasive sensors and poles for mounting.

3.8.18. Lane Use Signs and Side Mounted Variable Message Signs

LUS and SMVMS are a part of the ATM System that is currently being used by CDOT ITS. The following shall be designed and installed by the Developer:

a. Design Requirements

i. The Developer shall design the LUS to provide lane status information over each General Purpose Lane, Tolled Express Lane and auxiliary lane to Users along the I-70 corridor to notify drivers of Closures, restrictions, maintenance or merge conditions. The lane status information shall be displayed at one-half mile intervals between Pecos St. and Chambers Rd. in both directions of travel. The lane status information shall provide continuous visibility of the sequential LUS which can be mounted and combined with other sign structures. The LUS shall be a full-color, full-matrix DMS with a 64 by 64 pixel matrix at 20 mm pixel pitch and utilize a 24 bit red, green, blue color. The viewable area within should be maximized by reducing the bezel width (approximate sign size 60-inches by 60-inches). Plans showing LUS, SMVMS, DMS, and cameras shall include sight line angles and measurements and spacing of devices;

ii. At all LUS locations where full, overhead DMS are not provided, two SMVMS shall be installed. The SMVMS shall be mounted on both sides of the roadway within the drivers' sightlines and shall be full-color, full-matrix, with a minimum 80 by 80 pixel matrix at 20 mm pixel pitch and utilize 24 bit red, green blue color (approximate size 84-inches by 84-inches). The viewable area within should be maximized by reducing the bezel width. Refer to the Project Special Provisions, Appendix A to this Section 3 for the specific requirements for each component;

iii. All devices, software, and hardware shall be NTCIP compliant and compatible with the CTMS. The Developer shall verify that the device is properly communicating with CTMS, CDOT can control the device using CTMS, and the device is powered and functioning properly. The Developer shall work closely with CDOT's CTMS integrator, which will be hired by the Department, for software integration. CDOT shall integrate the LUS and SMVMS into CTMS;

iv. LUS must be designed so that they can easily be removed by two people in an overhead lift and this shall include removal and replacement of one LUS in less than 15 minutes from an overhead General Purpose Lane or Tolled Express Lane; and

v. The Developer shall visibly mark each sign structure with a unique identifier to assist operators in identifying structure location and direction from CTMC within the ATM software.

b. Construction Requirements

i. Structure cross sections are required and shall incorporate elements from this Section 3 and Schedule 10, Section 11 Signing, Pavement Markings, Signalization, and Lighting;

ii. Refer to Schedule 10, Section 12 Cover MEP System for LUSs and SMVMSs that are to be installed at the Portal and inside the Cover;

iii. The CTMS integrator shall be responsible for developing any graphics for the LUS and SMVMS and will provide to the Developer or sign manufacturer. The Developer or sign manufacturer shall request the graphics from the CTMS integrator 30 Calendar Days in advance and shall pre-load all graphics onto the signs; and

iv. Refer to Project Special Provisions, Appendix A to this Section 3.

3.8.19. Variable Toll Message Signs

The VTMS is a combination of a static sign with one electronic DMS insert utilized to display the specific tolls for each segment of the corridor. All I-70 Mainline VTMS shall be located upstream of the Tolled Express Lane ingress/egress point. This will allow Users sufficient time to read the toll rate and then make their decision whether to enter, or continue to use, the Tolled Express Lanes.

a. Design Requirements

i. The Developer shall design a complete VTMS system so that the following requirements are met:

A. VTMS shall be provided prior to each Tolled Express Lane ingress/egress point on the I-70 Mainline, and the VTMS shall be mounted overhead and positioned between the Tolled Express Lane and most-left General Purpose Lane, and visible to all roadway Users, including Users that have just entered the facility via entrance ramps;

B. All VTMS shall be mounted overhead. This includes one DMS insert capable of displaying the toll rates in each overhead sign as required for tolling purposes; and

C. VTMS sign panels, structures, and structure foundations shall be designed to accommodate two destinations and two electronic DMS inserts.

ii. The Developer shall furnish all new VTMS signs and any and all associated equipment necessary to achieve a fully-functioning system. The VTMS signs shall be designed based on the following material requirements, at a minimum:

A. The sign shall utilize LED displays;

B. The overhead signs shall be equipped with the ability to display a minimum of seven characters, including the toll rate, the “$” sign, the numerical value of toll rate, and decimal or the word “CLOSED”; all with a character height of at least 18-inches;

C. The pixel matrix shall be a minimum of 7 by 35;

D. The VTMS shall have a minimum design life of 20 years;

E. The sign viewing angle shall be 30 degrees; and

F. The VTMS cabinet shall be installed on a concrete foundation to the right of the travelled way and shoulder so that maintenance can be performed without the need for lane closures. UPS shall be provided for each VTMS

to ensure that each sign is operational for 8 hours in the event of a power failure. The Developer shall purchase and install the UPS in the controller cabinet.

b. Construction Requirements

i. The Developer shall be fully responsible for the furnishing and the installation of all VTMS signs and all damages that occur in the installation and delivery process. The VTMS shall be installed in accordance with manufacturer's recommendations; and

ii. CDOT will be responsible for the integration of each new VTMS into CTMS. The ETC System Integrator shall be responsible for incorporating the ETC Elements into the ETC system.

3.8.20. ITS Device Cabinets

a. Design Requirements

i. The Developer's design shall utilize ground or barrier mounted Type 332 or 332D cabinets for all VMS, VTMS, LUS, and SMVMS locations which shall be sized to accommodate all equipment. Type 2 cabinets shall only be allowed at sites where there are only CCTV cameras, MVRDs, TTIs, and DSRC radios. Type 2 cabinets may only be pole mounted on CCTV camera lowering device poles or sign structures. Type 1 cabinets shall only be allowed at isolated RWIS sites where there are no other devices connected to the cabinet; and

ii. The Developer shall create cabinet rack layouts for all cabinets.

b. Construction Requirements

i. All cabinets shall be installed per the manufacturer requirements or the requirements found in the Project Special Provisions, Appendix A to this Section 3; and

ii. The Developer shall furnish electrical and fiber quick disconnects at all cabinet locations not protected by guardrail or barrier.

3.8.21. Toll Point

The toll points collect information from vehicles so that Users are appropriately charged for use of the Tolled Express Lanes. A toll point is defined as a single toll collection point for one direction of travel.

Design Requirements

i. Each toll point includes AVI readers/antennas, ALPR cameras, an ETC lane controller, and a UPS, as well as all associated pull boxes, conduit, cabinets, structures, barrier, communications equipment, fiber connections and power for one direction of travel. The Developer shall be responsible for the design and installation of the ETC cabinet and associated foundation; the conduit to connect the ETC lane controller to the AVI antenna, in-pavement loops, and ALPR cameras; and providing communications and power to the cabinet;

ii. The Developer shall submit a toll point detail, including details of the overall layout for each toll point and the Elements of a toll point described above, for Approval by the Department prior to Construction Work of that Element. These details will be coordinated with and reviewed by both the Department and the ETC System Integrator;

iii. UPS shall be provided for each toll point to ensure that each ETC lane controller is operational for 8 hours in the event of a power failure. This works includes providing power service and conduit to the UPS cabinet. The Developer shall

purchase and install the UPS in a separate controller cabinet, as described in Project Special Provisions, Appendix A to this Section 3;

iv. All pavement joints within the vicinity of a toll point shall be coordinated with the ETC Integrator;

v. The Developer is responsible for providing outlets and circuit(s) in the new I-70/Airport Blvd. node building to accommodate the ETC System Integrator's servers and network equipment. These new circuits shall be protected by the UPS and generator; and

vi. The toll point locations will need to be coordinated with infrastructure, signing, striping and ITS Elements. The total number of tolling points is five (three in eastbound direction and two in the westbound direction). The approximate locations in the eastbound direction are York St., Monaco St., and Havana St. The approximate locations in the westbound direction are Havana St. and Holly St.

3.8.22. Automatic Vehicle Identification Reader

An AVI reader and antennas shall be installed at each toll point and used to read the toll tag information stored inside each transponder.

a. Design Requirements

i. The AVI reader shall be installed by the ETC System Integrator in the lane controller cabinet, and the antennas that will read the tag information shall be mounted directly above the Tolled Express Lane. The Developer shall be responsible for providing structures at each toll point (either dedicated or shared with another installation) to allow the ETC System Integrator to mount the AVI antennas in the correct positions;

ii. The AVI reader that shall be utilized is anticipated to be a Sirit Model 6204, which shall be installed by the ETC System Integrator. Each toll point shall require a structure installed by the Developer upon which two antennas per lane, per direction, shall be mounted 18.5 feet above the Tolled Express Lane. The AVI antenna shall be mounted on a 2-inch diameter pole spanning the Tolled Express Lane that allows for 6-inches of clearance between the pole and the bottom of the structure for angling and installation of the supporting hardware. In addition, the AVI antenna shall have 4 feet of lateral clearance. The Developer shall coordinate with the ETC System Integrator to ensure that the proper installation equipment is provided at each AVI antenna installation location;

iii. In addition to the structure, the Developer shall also provide two 2-inch conduits between the lane controller cabinet and the base of the structure supporting the AVI antenna. All cabling shall be installed internal to the structure. Communications to the AVI antenna shall be provided by coaxial cable installed by the ETC System Integrator. The Developer shall ensure that the lane controller cabinet and the structures used to support the AVI antenna equipment be as close together as possible to ensure that the maximum coaxial cable length does not exceed 175 feet; and

iv. The Developer shall be responsible for providing a bracket upon which the ETC System Integrator can mount the AVI antenna. The exact type of bracket will depend on the type of structure that the AVI antenna shall be mounted on. The Developer shall coordinate with the ETC System Integrator to determine the type and number of brackets that shall be necessary.

b. Construction Requirements

The ETC System Integrator shall be fully responsible for the furnishing and the installation of all AVI antennas.

3.8.23. Automatic License Plate Recognition Cameras and Loop Detector Wire

The ALPR cameras shall be used to obtain an image of the vehicle's license plate if a transponder is not detected. In-pavement loops shall be used to signal to the ALPR camera that a vehicle is present. Once the image is taken, the Optical Character Recognition (OCR) system inside the camera unit (or the lane controller) will process the image to identify the vehicle's license plate. This information will then be sent to the lane controller.

a. Design Requirements

i. The ALPR cameras and loop detector wire shall be mounted and installed by the ETC System Integrator. The ALPR cameras shall be mounted over each Tolled Express Lane. One ALPR camera shall be for front facing license plate photos and one ALPR camera for rear facing license plate photos. The ALPRs shall be mounted over each Tolled Express Lane on an overhead structure. The Developer shall be responsible for providing these structures at the toll point locations determined by the ETC System Integrator and the Department for each Tolled Express Lane;

ii. The overhead structure and mounting attachments for the ALPR cameras shall be designed and constructed by the Developer to meet the BS EN 60068-2-64 environmental test standards for vibration requirements;

iii. In addition to the structure, the Developer shall also provide two 2-inch conduits between each ALPR camera structure and the lane controller. Communications cabling from the lane controller cabinet to the ALPR cameras shall be provided and installed by the ETC System Integrator. The Developer shall ensure that the lane controller cabinet and the structures used to support the ALPR equipment be as close together as possible to ensure that the maximum coaxial cable length does not exceed 175 feet; and

iv. The ALPR cameras shall require an in-pavement loop detection system to signal to the cameras that a vehicle is present. Loops shall be saw cut into each Tolled Express Lane. The ETC System Integrator shall perform the loop installation and saw cutting, but the Developer shall provide the necessary pull boxes and conduit. The locations of the pull boxes and conduit shall be coordinated with the ETC System Integrator. In addition, the pavement surface temperature must be 50 degrees and rising in order for the ETC System Integrator to properly install the in-pavement loop sealant. As a result, the Developer shall coordinate with the ETC System Integrator to ensure the correct seasonal climate for the in-pavement loop installation.

b. Construction Requirements

The ETC System Integrator shall be fully responsible for the furnishing and the installation of all ALPR cameras and loop detector wire.

3.8.24. Electronic Tolling Lane Controller

The lane controller cabinet shall be located at each tolling point and shall be connected to the electronic tolling equipment via a conduit system. The lane controller will be used for all data processing and transmittal of transponder tag and license plate information via the fiber optic communications network to the ETC back-office for processing.

a. Design Requirements

i. The ETC System Integrator shall be responsible for the installation and configuration of the lane controller; the Developer shall be responsible for the design of the cabinet and associated foundation, the conduit to connect the lane controller to the AVI antenna, ALPR cameras, and transaction status indicator beacon, and the conduit to provide communications and power to the cabinet. One lane controller cabinet shall be provided for each tolling point location per

direction. If there is an eastbound and westbound toll point at the same location, two lane controller cabinets shall be required. The locations of the cabinets, foundations, and conduits shall be coordinated with, and approved by, the ETC System Integrator. However, the conduit system shall be designed such that the maximum cable length between the lane controller and the ETC devices (AVI antennas, ALPR cameras, and transaction status indicator beacon) shall designed such that the cable lengths do not exceed 175 feet; and

ii. The Developer shall have the following responsibilities at each toll point where a lane controller is required:

A. Provide a 3R NEMA rated Type M Stretch cabinet with a minimum size of 31-inches (width) 68-inches (height) by 19-inches (depth). Cabinets shall have a backplane with dimensions of 25-inches (width) by 54-inches (height) mounted on both fixed bolts. In addition, the Developer shall provide the required foundation on a level surface easily accessible for programming and maintenance purposes;

B. Provide a 12-strand single mode fiber optic communications lateral between the cabinet and CDOT's fiber optic backbone. The fiber optic lateral shall terminate at a patch panel that shall be installed inside the communications cabinet by the Developer;

C. Provide power to the cabinet to power the lane controller and all associated equipment and provide a UPS for backup power for up to 8 hours; and

D. Developer shall deliver tolling cabinet backplane, side planes, DIN rail and circuit breakers to the ETC System Integrator.

b. Construction Requirements

The ETC System Integrator shall be fully responsible for the furnishing and the installation of all electric tolling lane controllers.

3.8.25. Transaction Status Indicator Beacons

The enforcement will be on the inside shoulder for enforcement personnel to perform tolling enforcement at each toll point.

a. Design Requirements

i. A transaction status indicator beacon will be installed to signal to the enforcement personnel if toll transaction is recorded as a toll exempt high occupancy vehicle (HOV). This transaction status indicator beacon will be furnished and installed by the ETC System Integrator and meet the following material requirements:

A. Provide a blue LED transaction status indicator beacon that shall be activated when a User is identified as an HOV by the tag status file;

B. Developer to provide 2-inch conduit between the transaction status indicator beacon and the lane controller cabinet and connect the two devices;

C. Shall be outdoor-rated and weatherproof; and

D. Shall be visible to enforcement personnel in the adjacent enforcement zone.

b. Construction Requirements

The ETC System Integrator will be responsible for the furnishing and the installation of all transaction status indicator beacons.

3.8.26. Pull Boxes and Manholes

a. Design Requirements

i. The Developer's design shall utilize fiberglass reinforced, polymer concrete pull boxes and pre-cast concrete manholes with the interior dimensions of 4 feet (width) by 4 feet (length) by 4 feet (depth), with a cast iron frame ring and cover. Pull boxes shall be 24-inches by 36-inches minimum for fiber laterals or ITS and ETC power locations and manholes shall be used for all CDOT fiber backbone locations. Pull box and manhole spacing shall be as follows:

A. The manholes and pull boxes shall be clustered in a group wherever possible;

B. Pull boxes are not allowed in traffic areas, paved shoulders, paved roadways, and sidewalks, no exceptions. No fiber optic splicing shall be performed in CDOT pull boxes;

C. Manholes are not allowed in paved shoulders or paved roadways, unless specifically Approved by the Department;

D. The CDOT and Zayo manholes shall be spaced no greater than 1,200 feet apart and CCD pull boxes shall be spaced no greater than 500 feet apart as Accepted by the Department;

E. Pull boxes for ITS and ETC power shall be spaced no greater than 300 feet apart as Accepted by the Department;

F. Pull boxes or manholes shall be placed within 20 feet of the ITS and ETC equipment as Accepted by the Department, in safe, easy to access locations; and

G. Refer to the communications system requirements in this Section 3 for fiber coiling and splicing requirements in pull boxes and manholes.

ii. All pull boxes shall be constructed of fiberglass reinforced, polymer concrete and have a detachable cover with a skid-resistant surface and have the label of the owner cast into the surface. Painting of words shall not be allowed. All pull boxes shall be verified by a third-party nationally recognized Independent Testing Laboratory as meeting all test provisions of ANSI/SCTE 77 2007 Specification for Underground Enclosure Integrity, Tier 22 rating.

b. Construction Requirements

The Developer shall furnish and install all pull boxes and manholes based on the Construction Standards and any applicable Local Agency standards and specifications. Each location shall be easily accessible for maintenance purposes. Pull boxes shall not be placed in a known flood-prone area or drainage ditch. A fiber optic cable label shall be attached to each fiber optic cable located within a pull box or manhole.

3.8.27. Cabling and Conductors

a. Design Requirements

i. The Developer shall design all conductors and cables on the Project for voltage drop and load to account for additional 30 percent load capacity for future electrical needs. All cabling and conductors shall meet the CDOT standards and the National Electric Code (NEC). All electrical items shall be inspected by the state electrical inspector; and

ii. All ITS device control cables and connectors shall be designed in accordance with the manufacturer's recommendation and the CCTV camera manufacturer's signal attenuation requirements.

b. Construction Requirements

All cables shall be installed per the manufacturer requirements for each device or the requirements found in the Project Special Provisions, Appendix A to this Section 3. The maximum conduit fill ratio for both new and existing conduits shall be in accordance with the NEC.

3.8.28. Dedicated Short Range Communications Radios

The Developer shall install Dedicated Short Range Communications (DSRC) radios, Road Side Unit (RSU) between Pecos St. and Tower Rd. The DSRC radios, RSU shall be deployed to allow vehicle-to-infrastructure communications and support multiple applications.

a. Design Requirements

i. The Developer shall prepare a design to place DSRC radio, RSUs in such a manner that a vehicle equipped with connected vehicle technology traveling in any lane, including the General Purpose Lanes and Tolled Express Lanes, in both directions, shall be able to have constant communications with at least one DSRC radio, RSU throughout the Project limits. DSRC radio, RSUs shall be installed at a maximum of every two-thousand feet, or closer spacing if necessary, to meet communication requirements. More closely spaced placements shall be necessary to provide constant communications to the CTMC and to motorists to allow for traveler information. Communications are required at critical locations that may be affected by weather conditions, accidents, traffic congestion, and events;

ii. Locations expected to have a high density of connected vehicle field equipment may include roadway stretches with historically high congestion, on and off ramps, major interchanges, and other spot locations;

iii. DSRC radio, RSU shall be mounted on ITS infrastructure such as breakaway steel poles, camera poles or overhead sign structures. If colocation on an ITS pole or sign structure is not feasible, a new ITS breakaway steel pole shall be used;

iv. The Developer shall furnish new DSRC radio, RSUs and all associated equipment necessary to achieve a fully-functioning system. Prior to ordering the DSRC radio, RSUs, Developer shall provide product specifications for Acceptance by the Department;

v. The Developer shall submit a DSRC coverage plan, to the Department for Approval that shows proposed DSRC radio, RSU locations and that continuous radio coverage has been achieved throughout the corridor. The coverage plan shall show structures and terrain, including existing and proposed, within the coverage area. The coverage plan shall validate the communication range of each 5.9GHz band DSRC radio, RSU for both Transmitting and Receiving frequency band (5.850 – 5.925GHz), and data frames in the intended coverage area including both driving directions of the highway;

vi. Radio coverage shall be in accordance with manufacturer's recommendations and installation practices and accounted for on the coverage plan; and

vii. The radio interference shall be assessed at each DSRC radio, RSU location. The design shall be configured so that the performance is not degraded by the frequency interference by other radio signals. The Developer shall use a spectrum analyzer to identify other radio services in the frequency band of 5.850 – 5.925 GHz, and measure the impacts on the DSRC channel quality by other

licensed and/or unlicensed device transmissions as well as any detection and /or interference.

b. Construction Requirements

i. The Developer shall comply with the Federal Communications Commission (FCC) service rules, regulations, and technical requirements; including obtaining licensing and registration for every DSRC radio, RSU site;

ii. The Developer shall furnish all DSRC radio, RSU and carry out all installation, field-testing, and burn-in of the system per the manufacturer's recommendations and the Project Special Provisions, Appendix A to this Section 3. Refer to Testing and Integration Plan included in the Reference Documents for testing requirements;

iii. Each device shall be connected and communicated over the same network as ITS installation and have sufficient bandwidth for future connected vehicle applications (which may be different systems);

iv. Each device shall be connected to CDOT's communication system using fiber optic laterals, CDOT's fiber optic backbone and communications to a CDOT's node building. The Developer shall work with the Department's ITS staff to ensure acceptable communications to CTMC; and

v. The Developer shall provide power and all necessary equipment. Power service shall be through nearby electrical service drop.

3.9. Salvaging of Materials

The Developer shall salvage all existing ITS equipment that is affected by the Construction Work. Salvaged equipment shall be delivered to the Region 1 office located at 18500 East Colfax, Aurora Colorado 80011. The delivery schedule and a method statement for transport shall be Accepted by the Department. Delivery shall be coordinated with the Department 48 hours in advance of transport.

3.10. Integration and Testing

3.10.1. Integration and testing shall be conducted for all ITS devices and components that meet any of the following criteria:

a. A new device and/or cabinet supporting the device has been installed;

b. A device and/or cabinet supporting the device has been relocated;

c. The communications path between the devices and the local cabinet has been disturbed and/or relocated; and

d. A new communication path to a device has been established.

3.10.2. The Developer shall be responsible for the installation, communications design, terminations and testing and integration coordination of all ITS devices. This includes, but not limited to, all DMS, CCTV cameras, MVRD, TTI, ATR, RWIS, LUS, VTMS, SMVMS, ramp metering systems, DSRC radio, and all associated cabinets. All modifications to the CTMS will be performed by CDOT.

3.10.3. The Developer shall submit acceptance test procedures for all DMS, VTMS, LUS and SMVMS in accordance with the manufacturer's guidance for Acceptance by the Department. The test procedure shall be performed in the presence of the Department and the manufacturer's representative. The test shall also include the use of the latest version of the NTCIP Exerciser, or equivalent, to demonstrate that no proprietary protocols have been used and that the local and central software are NTCIP compliant. The Developer shall notify the Department at least 30 Calendar Days prior to the test date. These requirements for digital displays are in addition to the other testing and integration requirements that apply to all ITS Elements in the Central 70 Testing and Integration Plan included in the Reference Documents.

3.10.4. For all devices connected to the fiber optic communication network, Developer shall provide testing and integration per the Testing and Integration Plan.

3.10.5. The Developer shall submit a testing plan for the network design for Approval by the Department. The testing plan shall include a detailed method statement describing the splicing, testing plan, device cutover plan, and schedule.

3.10.6. The Developer shall perform the Department's testing procedures provided in the Central 70 Testing and Integration Plan included in the Reference Documents. This test plan does not encompass all testing procedures for all ITS elements and infrastructure. For all other devices not listed in the Testing and Integration Plan, the Developer shall develop a test plan according to the manufacturer's recommendations for conducting system and subsystem testing and submit it to the Department for Acceptance. Developer shall completely develop testing and integration so that every device and equipment is tested for functionality and integration. No testing shall be performed until the Department has Accepted the test plan. The Department ITS may adjust the proposed testing schedule by up to 30 Calendar Days, at no cost to the Department, to accommodate availability of personnel. The Department staff member or an authorized Department representative will witness and sign off on all tests.

3.10.7. The overall test plan that includes the Testing and Integration Plan and additional test plan according to manufacturers' recommendations, shall include the following:

a. The fiber optic cable testing shall be performed based on the requirements found in the Central 70 Testing and Integration Plan included in the Reference Documents;

b. A local field operations test shall be performed for all ITS devices to demonstrate that all hardware, cables, and connections furnished and installed by the Developer operate correctly and that all functions are in accordance with the requirements described herein. Verify the power supply voltages and the functionality of the cabinet fans and heaters. Provide the Department a 30 Calendar Day pretest notification and test completion notification. In addition, the Developer shall prepare a CDOT Device Installation Checklist for each installed device and submit to the Department for Acceptance;

c. Developer shall set up an ITS test laboratory for all proposed ITS devices and network equipment. See Project Special Provisions, Appendix A to this Section 3 for test laboratory requirements;

d. A subsystem communication throughput test over the communication path between each field device and the communications hub. The testing shall occur after all communication installation for a particular site has been completed, the communication paths between the device and the communications hub have been functional for at least 48 hours, and all fiber optic tests have been successfully passed. The Developer shall notify the Department at least 30 Calendar Days prior to beginning testing;

e. After successful completion of all subsystem test procedures and after all I-70 Mainline lanes, as well as ramps are open, test each site for proper communication operation for 30 Calendar Days. During the testing period, all equipment at the site that was provided, installed, or relocated by the Developer shall operate without failures of any type. If any component malfunctions or fails to provide the capabilities specified herein during the 30 Calendar Day test period, within 72 hours of notification by the Department, troubleshoot to find the exact cause of the failure. The cost of correcting equipment malfunctions shall be the responsibility of the Developer. After the component malfunction has been corrected to the satisfaction of the Department, restart the 30 Calendar Day test period; and

f. For all components which integrate with the ETC system, a system connectivity test shall be conducted in coordination with the ETC System Integrator.

3.10.8. Documentation indicating successful passing of each test shall be submitted to the Department for Acceptance. This shall include the completed deliverable checklist and forms from the Central 70 Testing and Integration Plan included in the Reference Documents.

3.11. Training and Documentation

The Developer shall provide the Department with instruction in the operation and maintenance of the hardware and software associated with the ITS equipment and infrastructure. The Developer shall also provide documentation for all ITS equipment.

3.12. Warranty

3.12.1. The Developer shall procure from the manufacturer standard warranties for all ETC and ITS equipment required to be provided by the Developer. In addition to such standard warranties, the Developer shall also ensure that the following warranty requirements are met:

a. For all DMS, LUS, SMVMS and VTMS, the warranty shall include 20 years from the Final Acceptance Date for telephone and technical support with access to a trained service representative who can respond within 24 hours to questions regarding all sign related equipment problems and maintenance issues at no additional charge to the Department;

b. The warranty in respect of UPS equipment for all DMS, VTMS, ETC equipment and other ITS devices shall include a repair option for UPS equipment extending at least 5 years from the Final Acceptance Date. Repair cost shall include all labor and materials necessary to complete the repair. The Developer shall be responsible for ensuring the vendor processes repairs for the 5-year period following Final Acceptance as part of the warranty;

c. For all ETC, and ITS cabinets, the cabinet manufacturer shall affix a permanent label on the inside of the door that identifies the cabinet type, date of manufacture, warranty expiration date and manufacturer's name. The warranty expiration date shall be expressed in the (mm/dd/yyyy) format. The warranty shall cover all cabinet materials and workmanship;

d. The Developer shall provide a 5-year warranty on all equipment included in Section 3 Appendix A Revision of Section 614 – Traffic Management Building Equipment. The warranty shall provide coverage on all equipment for 5 years from the Final Acceptance Date and include protection against lightning and electrical surges. Coverage for repair or replacement of equipment shall be provided;

e. The traffic management system building UPS manufacturer warranty shall cover onsite labor for 90 Calendar Days and start-up by the manufacturer; and

f. The CWDM OTDR shall include a full 4-year warranty by the manufacturer's direct service and support. The 4-year warranty period shall commence from the Final Acceptance Date. Service and support from a third party other than the manufacturer shall not be acceptable. This service and support shall be available both during and after the CWDM-OTDR warranty period. The manufacturer shall offer toll free phone technical service. In the event that repairs are required, the manufacturer shall have a maximum 3 day turnaround time in shipping the CWDM-OTDR fully repaired.

3.12.2. Sections 2.2.6 and 3.2.8 of Schedule 11, Operations and Maintenance Requirements set out the Developer's O&M Work responsibilities in respect of ITS and ETC facilities.

3.13. Deliverables

At a minimum, the Developer shall submit the following to the Department for Information, Acceptance or Acceptance in accordance with the specified timeframes:

Table 3-1 Deliverables

Deliverable	Information, Acceptance, or Approval	Schedule
Maintenance of ITS Plan	Acceptance	30 Calendar Days prior to start of disruption of communications or device outages in the area.
ITS Roll Plot	Acceptance	Preliminary (30%) plan level
ITS and ETC Design Plans and Details	Acceptance	At final (100%) design review, and RFC
ITS and ETC Device and Material Specification Sheets	Acceptance	30 Calendar Days prior to placing order of device or equipment
Test Plan according to the manufacturer's recommendations	Acceptance	After issuance of NTP 2 and 30 Calendar Days prior to testing and integration of ITS and ETC devices
Network and Splicing Plans	Approval	At final (100%) design review, and RFC
CDOT Device Installation Checklist	Acceptance	30 Calendar Days prior to device integration
Fiber Test Results	Acceptance	10 Calendar Days after completion of test
Documentation Indicating Successful Passing of Each Test	Acceptance	30 Calendar Days after completion of test
Cross sections for ITS, and ETC structures	Approval	At preliminary (30%) structural design of the sign structures, final (100%) design review, and RFC
ITS pole and tower cross sections for all CCTV, MVRD, TTI, DSRC poles, RWIS, Environmental Friction System	Approval	At preliminary (30%), final (100%) design review, and RFC
Ramp metering equipment and ground mounted cabinet cross sections	Approval	At preliminary (30%), final (100%) design review, and RFC
Profile Plans for LUS, SMVMS, DMS, and VTMS structures	Approval	At preliminary (30%), final (100%) design review, and RFC.
CCTV and DSRC Coverage Plans	Approval	At preliminary (30%) and final (100%) design review, and RFC.
Device Orientation Details	Approval	At final (100%) design review, and RFC.
Supporting reports and design calculations	Information	At final (100%) design review, and RFC.
Testing Plan for the Network Design	Approval	At final (100%) design review, and RFC.
Terms of warranties required by Section 3.12	Acceptance	30 Calendar Days prior to placing order of device or equipment

3.14. Appendices

Appendix A Project Special Provisions

Appendix B Responsibility Matrix

Appendix A
Project Special Provisions for ITS and Tolling Equipment Elements

The following special provisions supplement or modify the *Standard Specifications* and take precedence over the *Standard Specifications* and plans. The provisions of Appendix A to Schedule 10A Applicable Standards and Specifications apply to these Project Special Provisions.

PROJECT SPECIAL PROVISIONS

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Revision of Section 612 – CDOT ITS Location Markers	3-43
Revision of Section 613 – CDOT and CCD Electrical Conductor Identification	3-44
Revision of Section 613 – CDOT Electrical Conduit	3-45 to 3-48
Revision of Section 613 – CDOT Pull Boxes	3-49 to 3-50
Revision of Section 613 – Electrical Conduit (Liquidtight Flexible Metal)	3-51
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Revision of Section 614 – Dynamic Message Sign (Color LED) (Overhead)	3-54 to 3-73
Revision of Section 614 – Dynamic Message Sign (Amber)	3-74 to 3-89
Revision of Section 614 – Lane Use Sign and Sidemount Variable Message Sign	3-90 to 3-102
Revision of Section 614 – Variable Toll Message Sign (VTMS)	3-103 to 3-114
Revision of Section 614 – Uninterruptible Power Supply for Toll Equipment	3-115 to 3-117
Revision of Section 614 – Uninterruptible Power Supply for Variable Toll Message Sign (VTMS)	3-118 to 3-120
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Revision of Section 614 – Ethernet Router (5160)	3-202 to 3-205
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Revision of Section 614 – Dense Wave Division Multiplexing (DWDM)	3-217
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PROJECT SPECIAL PROVISIONS

	Pages
Revision of Section 614 – Optical Attenuator	3-223 to 3-224
Revision of Section 614 – Single Wavelength Coarse Wavelength Division Multiplexing (CWDM) Optical Filter	3-225 to 3-226
Revision of Section 614 – Coarse Wavelength Division Multiplexing Module	3-227 to 3-228
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REVISION OF SECTION 604
CDOT ITS MANHOLE FOR TRAFFIC MANAGEMENT SYSTEM

Section 604 of the Standard Specifications is hereby revised for this Project to include the following:

DESCRIPTION

CDOT ITS Manhole Traffic Management System (Manhole TMS) shall include the installation of manholes for the Traffic Management System at locations Approved by the Department.

MATERIALS

Manhole TMS shall be pre-cast concrete, circular or square, with a base and cast iron frame ring and cover. Each Manhole TMS, frame, and cover shall conform to American Association of State Highway and Transportation Officials (AASHTO) HS20-44. Manhole TMSs shall be capable of accepting concrete grade rings to add height to raise the ring and cover to a future finished grade.

Pre-cast units shall be provided with factory-installed knockouts that will permit the installation of a minimum of 6 of 2-inch conduits. The factory-installed knockouts shall be at a depth of 3 feet below the top of the Manhole TMS. The Manhole TMS shall have a detachable cover that has a skid-resistant surface and have the words “CDOT COMM” cast on top of cover. The cover shall be attached to the Manhole TMS body with screw-in bolts.

Each Manhole TMS shall include all hangers and hooks that needed all proposed fiber and communication cabling. Fiber management hangers and hooks for fiber coils and splice canisters shall be of sufficient quantity to hang each backbone and lateral cable installed in the Manhole TMS separately.

CONSTRUCTION REQUIREMENTS

The Contractor shall neatly excavate the site of Manhole TMS installation. A minimum of 12 inches of ¾ inch granite-gravel shall be placed below the Manhole TMS.

In pavement and sidewalks, the top of the Manhole TMS shall be flush with the existing or final proposed grade. Outside of pavement and sidewalks, the top of the Manhole TMS shall be 2 inches above existing or final proposed grade.

Backfill around the Manhole TMS excavation shall conform to Section 206, Structure Backfill (Class 2).

Fiber optic cable coils shall be tied to each cable rack with plastic cable ties. The Contractor shall coil the fiber cable per the manufacture’s recommendations. If hangers are not factory installed in the Manhole TMS, the bolts shall be installed in the Manhole TMS walls by means of either an epoxy compound or expansion type fitting. Conduit entering the Manhole TMS base shall have sweeps attached so conduit entrance is elevated a minimum of 6 inches above the bottom of the Manhole TMS.

Manhole TMS will include marking conduit ownership in each, the Manhole TMS, excavation and backfill, hooks to hang coils, all cable innerduct, conduit inside Manhole TMS, all hardware, as well as all equipment and labor necessary to install the Manhole TMS. Capping and sealing the conduits shall be included. Backfill for Manhole TMS shall conform to Section 206, Structure Backfill (Class 2).

REVISION OF SECTION 612
CDOT ITS LOCATION MARKERS

Section 612 of the Standard Specifications is hereby revised for this Project to include the following:

DESCRIPTION

Contractor shall furnish and install Location Markers for identifying fiber optic conduit and other utility conduit at locations shown on the plans.

MATERIALS

Location Marker (Fiber Optic) (Dome) shall be made of non-conductive high-density polymer, and shall be integrally white in color with an orange cap. All colors shall be stabilized against ultraviolet light such that they will not fade under continuous exposure to direct sunlight. The Location Marker shall retain size and shape and rigid in temperatures ranging from -40º F to 175º F.

The Location Marker (Fiber Optic) (Dome) shall include a label with CDOT contact information and the designation of "FIBER OPTIC CABLE". The label shall have black lettering on an orange background. The label shall include the highway milepost of the pull box or manhole. The mile post shall be to the nearest hundredth mile. This label shall be placed below the "FIBER OPTIC CABLE" warning label. The Contractor shall submit the label design to the Department for Acceptance.

Location Marker (Utility) (Flat Slat) shall be made of fiberglass reinforced composite, and shall be color orange for telephone or red for electric.. The Location Marker shall retain size and shape and rigid in temperatures ranging from -40º F to 175º F.

The Location Marker (Utility) (Flat Slat) shall include a label with CDOT contact information and the designation of "ELECTRICAL CABLE" or "TELEPHONE CABLE". The label shall have black lettering on a red background for electrical and black lettering on an orange background for telephone. The Contractor shall submit the label design to the Department for Approval.

Concrete footing for dome marker shall be 18 inches x 18 inches x 12 inches per Project detail. Concrete footing shall be Concrete Class B and shall be in accordance with Section 601.

CONSTRUCTION REQUIREMENTS

Location Marker (Fiber Optic) (Dome) shall be installed at all pull box and Manhole TMS locations that contain fiber optic cable. Intermediate Location Markers shall be installed evenly at a maximum of 1000 foot spacing along each conduit run.

Location Marker (Utility) (Flat Slat) shall be installed at utility pull box and manhole locations and utility point of service to identify both electric and telephone communication lines. Contractor shall designate the utility line with a Location Marker installed at mid-point between the utility point of service and the device.

REVISION OF SECTION 613
CDOT AND CCD ELECTRICAL CONDUCTOR IDENTIFICATION

Section 613 of the Standard Specifications is hereby revised for this Project as follows:

Section613.08 shall include the following:

All electrical conductors shall be tagged as follows:

Electrical conductor cable tags shall be located below the termination in the base of the street light, in the pull box, in the pedestal and at the point of termination to existing facilities of the local utility company supplying the electrical service. The tags shall be attached with a cable tie. The information written on the tag shall include the direction and approximate length of cable feeds running from where to, etc.

Each incoming conductor shall be individually color coded with 1 tape mark, while outgoing conductors shall have 2 tape marks.

Example:

FEEDS TO PULL BOX 50’ NORTH & 75’ WEST THEN TO HIGHWAY SIGN	FEEDS FROM XFMR 250’ SOUTH & 75’ EAST 200’ WEST

Uniform tags are available in a Tag Kit. The Tag Kit consists of: 100 tags, 3 part yellow with 1 hole, 100 black nylon ties and 1 black permanent marker.

Size	2-1/2" X 5"
Standard Package	Kit
Weight, Kit, Approx.	1.5 Pounds
Color	Yellow

REVISION OF SECTION 613
CDOT ELECTRICAL CONDUIT

Section 613 of the Standard Specifications is hereby revised for this Project to include the following:

DESCRIPTION

This work includes furnishing and installing new High-Density Polyethylene (HDPE) and Polyvinyl Chloride (PVC) Electrical Conduit and fittings for use with fiber optic cable, electrical conductors, and communications cabling.

MATERIALS

All materials furnished, assembled, fabricated, or installed under this item shall be new, Underwriters Laboratories (UL) listed, corrosion resistant and National Electric Code (NEC) compliant. Materials shall be submitted to the Department for Approval.

Electrical Conduit shall be Schedule 80. Electrical Conduit and fittings shall be UL listed.

HDPE conduit and fittings shall be certified by the manufacturer as meeting American National Standards Institute (ANSI) ANSI/UL 651A. PVC conduit and fittings shall be certified by the manufacturer as meeting ANSI/UL 651. The manufacturers shall be International Organization for Standards (ISO) 9001 compliant.

All HDPE conduit shall be factory lubricated, low-friction, high-density conduit constructed of virgin high-density polyethylene resin. HDPE conduit shall be capable of being coiled on reels in continuous lengths, transported, stored outdoors, and subsequently used for installation, without affecting its properties or performance.

Each conduit shall be equipped with a pull tape. The pull tape shall have a minimum tensile strength of 1800 pounds and be of a design and manufacture that prevents cutting or burning into the conduit during cable installation. The pull tape shall include a continuous 22 gauge tracer wire. Splices in the pull tape and tracer wire are allowed inside manholes and pull boxes but shall not be permitted inside conduit.

A minimum 12 gauge tracer wire shall be included in conduits containing fiber optic cable.

Where multiple conduits are installed in a joint trench, the Contractor shall use Department-Approved commercially available conduit spacers that provide separation between the conduits, as well as anchor the conduit into the bottom of the trench. The conduit spacers shall be factory-certified to accommodate all handling pressures and stresses associated with conduit installation.

Where conduit encasement is required, the concrete used shall conform to CDOT standards.

All of CDOT's five 2 inch conduits in the joint trench shall be orange in color and CCD's conduit(s) in the joint trench shall be green with an orange stripe. The following conduit colors shall be used for additional conduits installed so that the contents can be easily identified. If more than 3 conduits are installed then the other colors shall be grey and blue:

1. Conduit for CDOT fiber optic —Orange
2. Conduit for power—Red
3. Conduit for future use—Grey or Blue

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REVISION OF SECTION 613
CDOT ELECTRICAL CONDUIT

CONSTRUCTION REQUIREMENTS

All conduit and fittings installation shall conform to the NEC.

Electrical conduit installed using a trenchless technology such as directional boring shall be HDPE.

Electrical conduit that is installed by direct burial methods such as plowing, open trenching, or other excavation methods shall be PVC or HDPE.

Prior to construction, the Contractor shall prepare a trenching and boring plan. The plan shall show the limits of the planned work areas and the areas of anticipated disturbance. All disturbances outside the planned work areas created by Contractor's operations shall be restored to their original condition at the Contractor's expense.

During construction operations, the Contractor shall maintain boring logs that include the depth at specific distances along the bore. Boring logs shall be submitted on a weekly basis.

Excavations and conduit installation shall be performed in a continuous operation. All trenches shall be backfilled by the end of each shift. Material from trenching operations shall be placed in a location that will not cause damage or obstruction to vehicular or pedestrian traffic or interfere with surface drainage.

Where multiple conduits are installed in a joint trench, the Contractor shall install conduits in a manner that allows the backfill material to completely surround all exterior surfaces of the conduit. The Contractor shall separate conduits using conduit spacers. The conduit spacers shall be installed per the manufacturer's recommendations. The Contractor shall demonstrate to the Engineer that the spacers are properly anchored and maintaining proper depth.

The Contractor shall be responsible for damage due to over-excavating a trench and heaving damage to the existing asphalt and concrete mat, caused by equipment directly and by dislodging rocks or boulders. All damage from over-excavation and heaving shall be repaired at the Contractor's expense. The Contractor shall bear the cost of backfilling all over-excavated areas with backfill material Approved by the Engineer.

Conduit installed longitudinally under roadway surfaces shall be encased in concrete. The Contractor shall use a process to install the conduits that ensures the conduits do not float up in the concrete and shall use interlocking spacers manufactured for use in encased conduit installation. All debris that falls in the trench during the placement and positioning of the conduits and concrete shall immediately be removed. The plastic conduits shall be placed in the trench in such a way that they will be straight and located at the depths shown in the plans.

(1) If conduit is installed prior to the placement of the concrete below the conduits, the conduits shall be bundled and supported by manufactured conduit spacers to allow the concrete to flow under and between the conduits to the proper dimensions without displacing the unsupported sections of conduit. Conduits shall be bundled, supported and anchored at a maximum distance of 5 feet if concrete is placed around the conduit.

(2) If the concrete below the conduits is placed prior to the installation and positioning of the conduits, the concrete shall be placed in such a way so that the conduits are not curved or damaged. The conduits

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REVISION OF SECTION 613
CDOT ELECTRICAL CONDUIT

shall then be positioned, bundled by manufactured conduit spacers and anchored as required at their proper position as the remainder of the concrete is placed to the required depth.

The Contractor shall restore all surface materials to the original condition or better. This includes but is not limited to pavement, sidewalks, sprinkler systems, landscaping, shrubs, sod, and native vegetation that is disturbed by the conduit installation operation.

The Contractor shall use UL listed splice couplings that comply with the NEC. All associated work to splice the conduit shall be included in the cost of the item. The coupling technology used to connect conduit ends shall require no special tools and form a watertight, airtight seal. The breaking force between segments shall exceed 250 pounds. Conduit splices shall be kept to a minimum and all such locations shall be Approved and inspected by the Engineer and the authority having jurisdiction. Additional pull boxes shall not be substituted for conduit splices.

Conduit plugs that are watertight, removable, mechanical and equipped with a tie rope for connection to a pull rope and pull tape shall be supplied and installed in all open conduit ends as soon as the conduit is installed. Conduit shall be plugged at all termination points including, but not limited to pull boxes, manholes, controller cabinets and node buildings. Conduits containing cable shall be plugged with durable and reusable split type plugs, fabricated without metallic parts. The plugs shall allow easy removal and reinstallation around in-place cables. Split type plugs shall provide a watertight and airtight seal of at least 22 pounds per square inch. They shall be installable by hand without using tools and without damaging the cable. All plugs shall be correctly sized to fit the conduit being plugged.

All conduits shall use sweeps to elevate the buried conduits to the final grade within a pull box or manhole. The sweeps shall be terminated within the pull boxes and manholes to allow for easy installation and removal of conduit plugs. The sweeps shall be set above the ground surface of the inside of the pull box at a height that does not interfere with coiling of the fiber optic cable. The color of the sweeps shall match the color of the conduit it is attached to. All sweeps shall have a label attached identifying owner, use, and direction conduit is running. The label shall be attached with a durable material, such as zip ties, and shall be readable for 20 years.

Unused conduit shall be plugged with mechanical duct plugs that provide a watertight barrier. Duct plugs shall be removable. Plugs shall be of the proper size for the conduit diameter being plugged.

Mechanical sealing devices shall be used to provide a watertight barrier between the conduit and communications cable. Seals shall be of the proper size for the conduit diameter and cable diameter being sealed. Mechanical seals shall be removable.

All conduits terminating in a pole or sign structure shall extend to a point 6 inches below the handhole in the pole or structure.

All conduit runs containing fiber optic cable shall have a limited number of bends. The sum of the individual bends on a single conduit run between any two pull points shall not exceed 270 degrees. No individual bend shall exceed 90 degrees. All conduit bends shall have a minimum acceptable radius of 48 inches for 90 degree bends and for conduit containing fiber optic cable and 24 inches for all other bends. HDPE conduit minimum bending radius shall conform to Table 354.24 in the NEC.

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REVISION OF SECTION 613
CDOT ELECTRICAL CONDUIT

New conduits may be installed into existing pull boxes, manholes and cabinet bases, and the Contractor shall carefully excavate around the existing facility and install the new conduit as shown on the plans. The Contractor shall not damage the existing facility or its contents. If the existing conduit, pull box, lid and concrete collars are damaged during conduit installation, the Contractor shall restore the damaged item or section to current CDOT requirements at no additional cost to the Project.

Conduit shall always enter a pull box, manhole, cabinet base and all other structure types from the direction of the run only.

All conduits ends shall be free from sharp edges and burrs.

Conduit shall also include all groundwork, lubricants, anchors, bands, skids, sweeps, pull rope, pull tape, copper tracer wire, adaptors, fittings, splice couplings, conduit plugs, foam sealant, installation equipment, mounting brackets and hardware, structure anchors, adhesives, labor and all other items necessary to complete the work.

REVISION OF SECTION 613
CDOT PULL BOXES

Section 613 of the Standard Specifications is hereby revised for this Project to include the following:

DESCRIPTION

Contractor shall furnish and install fiberglass reinforced polymer concrete pull boxes and concrete aprons.

MATERIALS

Pull boxes shall be verified by a 3rd Party Nationally Recognized Independent Testing Laboratory as meeting all test provisions of American National Standards Institute/Society of Cable Telecommunications Engineers (ANSI/SCTE) 77, 2013 Specification for Underground Enclosure Integrity, Tier 22 rating. Pull boxes shall be Underwriters Laboratories (UL) listed. Certification documents shall be submitted with material submittals.

Each pull box shall have an Electrical Marker System (EMS) locator disk manufactured into the lid for communication line locating. The locator disk shall be compatible with a CDOT cable locator and utilize the APWA Uniform Color Code standard for visual reference, if disk is observable on the exterior of the lid. The locator disk shall utilize the proper locate frequency for the pull box type.

Pull boxes 24 inches by 36 inches and larger shall have removable split lids with a removable metal center support beam. Lid segment weight shall not exceed 100 pounds.

One piece lids shall have a minimum of two lift slots per lid, while split lids shall have a minimum of one lift slot per lid. Lift slots shall be rated for 3,000 pounds.

Pull box removable lids shall be provided with a skid-resistant surface and have the words “CDOT COMM”, or “CDOT POWER”, as well as “EMS MARKER EMBEDDED IN COVER” and the tier level rating cast into the surface. Painting of words shall not be accepted. The cover shall be attached to the pull box body by means of 3/8 inch x 7 inch lag thread hex head stainless steel bolts.

Test point locations shall be integrated into the pull box lids to provide for attachment of test leads of various connector types for underground conduit tracing. The minimum number of test point locations shall equal the number of conduit banks entering the pull box, up to a maximum of five test points. Pull boxes with split lids shall have the test points on one split lid section only. Pull box lids shall be furnished with 3/8 inch x 1/16 inch deep recesses at locations adjoining each test point for the application of direction arrow symbols indicating the direction of underground conduit exiting the pull box. Recesses shall be thoroughly cleaned with alcohol prior to applying arrow symbols.

Wire mesh shall be installed in a manner to completely surround the box. The wire mesh shall meet the material standard ANSI/American Society of Testing and Materials (ANSI/ASTM) A555-79 and made of T-304 stainless steel, 0.025 inch wire diameter minimum and shall have a spacing of 10 mesh per inch.

Pull boxes installed in dirt or landscaped areas shall have a Class B concrete apron or a pre-cast polymer concrete apron. Class B concrete shall be in accordance with Section 601.

The pre-cast polymer concrete apron shall be non-metallic, non-conductive, and UV resistant, and shall include 2 lifting slots for placement in the field. The pre-cast polymer concrete apron shall be a minimum 4 inches deep and shall extend 11 inches (minimum) from each side of the pull box. The gap

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REVISION OF SECTION 613
CDOT PULL BOXES

between the pre-cast polymer concrete apron and outer wall of the pull box shall be a maximum of ½ inch.

Pull Box (Surface Mounted) shall be aluminum type with a hinged front door and have at least a National Electrical Manufacturers Association (NEMA) 3R rating. The hinged door shall be provided with both a weather tight seal and an aluminum hasp. The use of surface mounted pull boxes shall be Approved by the Department.

CONSTRUCTION REQUIREMENTS

A minimum of 12 inches of ¾ inch granite-gravel shall be installed as a base for the pull box. The granite-gravel shall be free of dirt and debris and spread evenly to facilitate a level base for the pull box. The Contractor shall ensure that sufficient compacting is made prior to the installation of granite-gravel to alleviate future settling.

Wire mesh shall be installed in to completely surround the box. The wire mesh shall be installed prior to the installation of the pull box above the bed of 3/4 inch granite-gravel. The wire mesh shall be gently cut to allow only the entrance of the conduit through at the bottom of the box. All openings cut in the wire mesh that are larger than the diameter of the conduit shall be covered with additional wire mesh in a manner to completely surround the pull box with wire mesh.

Tracer wire shall be attached to the trace test points on the underside of the pull box lid. Each tracer wire shall be attached to an individual trace point; no 2 wires shall be attached to the same point. The Contractor shall coil an additional 6 feet of tracer wire inside the pull box to ensure that the tracer wire will not disconnect from test points when the lids are removed.

At pull boxes installed in dirt and landscaped areas, the Contractor shall install a concrete apron or a pre-cast polymer concrete apron around the edges of the pull box. Three sides of the concrete apron shall measure 12 inches wide by 6 inches deep and one side shall measure 18 inches wide by 6 inches deep. The apron side measuring 18 inches wide by 6 inches deep shall be located on the edge of the pull box furthest from the roadway, and shall contain a 4 inch diameter round knockout for fiber optic location marker installation. Pull boxes shall not be installed above the grade of the apron. The concrete apron shall have a one percent slope away from the top of pull box to allow for drainage.

Surface mounted pull boxes shall be mounted on or embedded into hard surfaces such as bridge decks, concrete barriers, retaining walls, or buildings. Surface mounted pull boxes shall be attached using 3/8 inch epoxy anchors or other methods Approved by the Department. Surface mounted pull boxes shall not be used for ground installations. Pull rope and tracer wire shall be installed in surface mounted pull poxes.

Pull boxes will include base, lid, integrated location disk, integrated test points, arrow symbols, excavation, backfill, concrete apron, wire mesh and 3/4 inch granite-gravel. Pull boxes shall also include the removal and patching of pavement, sidewalks, curb and gutters and their replacement in kind to match existing grade.

REVISION OF SECTION 613
ELECTRICAL CONDUIT (LIQUIDTIGHT FLEXIBLE METAL)

Section 613 of the Standard Specifications is hereby revised for this Project to include the following:

DESCRIPTION

This work includes furnishing and installing new liquidtight flexible metal conduit (LFMC) and fittings for use with fiber optic cable, electrical conductors and communications cabling. All underground-to-aboveground and aboveground conduit installations shall utilize LFMC.

MATERIALS

All materials furnished, assembled, fabricated, and installed under this item shall be new, Underwriters Laboratories (UL) listed, corrosion resistant, and National Electric Code (NEC) compliant.

LFMC shall meet UL safety standard UL 360 –Liquid-Tight Flexible Metal Conduit.

The LFMC shall be rated for use in wet locations.

For below ground to above ground transitions, the Contractor shall use LFMC to Polyvinylchloride (PVC) couplings or LFMC to High Density Polyethylene (HDPE) couplings.

CONSTRUCTION REQUIREMENTS

Prior to installation, the Contractor shall submit technical data sheets for all conduit types, couplings, fittings, elbows, L-bends, mounting hardware, conduit plugs, and sealing plugs to the Engineer for written approval.

LFMC shall be installed in all below ground to above ground conduit transitions. Below ground, the Contractor shall couple the LFMC conduit to the below ground conduit using approved coupling technology that is listed for use with LFMC.

Above ground LFMC shall be installed between pole-mounted communications cabinets and device poles. LFMC shall be installed for connections between the sign structure and housings for Dynamic Message Sign (DMS), Lane Use Sign (LUS), and Sidemount Variable Message Sign (SMVMS), as well as for connections to ETC and ITS equipment. For above ground LFMC entries into cabinets, poles, sign structures, and sign housings, the Contractor shall use fittings listed for use with LFMC. At entries into cabinets, poles, sign structures, and sign housings, the Contractor shall ensure that the entry hole is free from sharp edges and burrs.

The Contractor shall use factory drilled entries for connection of LFMC to cabinets, poles, and DMS housings. If the LFMC is to be used on an existing structure or cabinet on which no factory drilled entry exists, the Contractor shall receive Approval from the Department prior to field drilling cabinets, poles, and DMS housings.

At field drilled steel poles, the Contractor shall repair all damaged galvanizing by hot dip or metallizing process as described in American Society for Testing and Materials (ASTM) ASTM A780 or shall paint with one full brush coat of a zinc-rich paint meeting Military Specification Department of Defense (DOD) DOD-P-21035A. Spray can applications of zinc will not be allowed. LFMC installation shall conform to the requirements of NEC Article 350 LFMC and shall be secured and supported per NEC Article 350.30.

REVISION OF SECTION 613
SERVICE METER CABINET

Section 613 of the Standard Specifications is hereby revised for this Project as follows:

Subsection 613.01 shall include the following:

This work consists of the installation of a Service Meter Cabinet including the preformed polymer concrete footing, meter cabinet, mounting hardware, Cabinet mounting base, power cables, UV-resistant cables and connection to the power source and all required wires and wiring to facilitate a fully functioning Service Meter Cabinet at locations as shown on the plans.

Add subsection 613.09 (a) as follows:

(a) *Service Meter Cabinet*

The Service Meter Cabinet shall be National Electrical Manufacturer Association (NEMA) 3R and shall be UL 508 listed as industrial control panel service equipment. It shall have the ability to be padlocked at the location shown on the Service Meter Cabinet detail.

Utility metering compartment shall be protected with a hinged, pad lockable hood.

Service conductor terminations shall be accessible by a removable cover.

The Service Meter main shall be 100 amp minimum, with voltage range of 120V – 480V.

The Service Meter Cabinet shall be compatible with both ringless and ring-type meter sockets, and with 4-7 terminals.

Exterior of the Service Meter Cabinet shall be a gray powder-coated aluminum, with a thickness of 0.125 inches which is rain and dust impermeable and electrically welded and reinforced where required.

The Service Meter Cabinet shall have a swing dead front door compartment with distribution and control equipment that is secured with both a latch and a pad lockable draw latch outer door.

All nuts, bolts, screws and hinges shall be stainless steel and not visible from outside the Service Meter Cabinet.

Service Meter Cabinet and polymer concrete foundation shall have a divider to separate the service and load conduits/ conductors.

The Service Meter Cabinet shall provide accommodation for four, single branch circuit breakers at a minimum, not including the main breaker. Circuit breakers shall be cable-in, cable-out with line on top, and load on bottom. Handle position shall be up = ON, down = OFF.

The polymer concrete foundation shall have 1/2 inch-13 unified course (UNC) through bolt inserts for mounting the Service Meter Cabinet.

The polymer foundation shall pass the most recent addition of the ANSI/SCTE 77 6.0, 6.1, 6.2, 6.3, 6.4 & 6.5 environmental test, including a 5 percent solution of magnesium chloride.

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REVISION OF SECTION 613
SERVICE METER CABINET

The divider plate between the service conduit and load conduit shall be full depth of foundation and be made of preformed polymer concrete.

All materials furnished, assembled, fabricated or installed shall be new, corrosion resistant and in strict accordance with the details shown on the Service Meter Cabinet detail and in these Technical Specifications.

Functional Characteristics:

The Service Meter Cabinet shall provide a viewing window in which the meter shall be readable while providing a vandalism resistant enclosure. Viewing window shall be comprised of bullet resistant polycarbonate resin thermoplastic.

Physical Characteristics:

Refer to the Service Meter Cabinet detail for specific dimensions and tolerances.

CONSTRUCTION REQUIREMENTS

Add Subsection 613.03(a), Service Meter Cabinet:

The Contractor shall go through the Colorado State Electrically Board to acquire the electrical installation permit prior to the installation of the meter Cabinet equipment for all CDOT owned and maintained traffic signal and lightning.

Installation shall conform to the latest edition of the National Electrical Code (NEC) and the Authority Having Jurisdiction.

The Service Meter Cabinet foundation shall be polymer concrete with fiberglass reinforcement. The pad shall be continuous cloth reinforcement on the inside and outside perimeters.

The Service Meter Cabinet shall be factory wired and inspected by CDOT ITS prior to installation.

Construction methods shall conform to the requirements of Section 614.10 (c), Section 614.10 (d) and Section 614.10 (j).

The Contractor shall certify the records of the testing including grounding, voltage drop (within 3 percent) and other required tests as meeting specification requirements and submit the records to the Engineer.

Subsection 613.11 shall include the following**:**

Service Meter Cabinet will include the foundation, all internal wiring, hardware, polymer foundation, excavation, meter, back fill, disposal of excess excavation, crushed rock, UNC inserts and everything shown on Service Meter Cabinet Detail example provided in the Reference Documents.

REVISION OF SECTION 614
DYNAMIC MESSAGE SIGN (COLOR LED) (OVERHEAD)

Section 614 of the Standard Specifications is hereby revised for this Project to include the following:

DESCRIPTION

This work consists of furnishing and installing overhead, walk-in accessible Dynamic Message Signs (DMS), sign controller, and associated uninterruptible power supply (UPS) system, DMS equipment cabinet and cabinet foundations. The sign shall be fully compatible with the mounting hardware and support structure designed by the Contractor. The DMS shall be equipped with the ability to display 3 lines of text at a height of 18-inch tall characters and 18 characters per line, and shall have a display made up of a full color matrix configuration. The DMS shall be equipped to display 24 bit color messages and graphics using red green and blue Light Emitting Diodes (LEDs). The sign shall have 32-35 mm pixel spacing. The color LEDs shall have a viewing angle of 30 degrees.

The sign shall be 26 feet wide by 8.5 feet tall by 4 feet deep with an allowable variation of (plus or minus 7 inches). The size of the DMS for cover portals shall be as specified in Schedule 10, Section 12.

The sign shall include a main service power shut off mounted to the sign structure. The sign shall be capable of operating without any decrease in performance over a temperature range of -34° F to +140° F with a relative humidity of 0 to 99 percent, non-condensing. The UPS system shall be capable of running essential sign control electronics, communication equipment, and half of the pixels in the LED sign face allowing messaged display, and sign communication/control for a minimum of 8 hours depending on the number of batteries used.

MATERIALS

a. *Certifications.* Prior to start of the installation of the DMS the Contractor shall provide the following certifications to the Engineer for review and Approval:

1. Certification showing that the manufacturer of the DMS is fully compliant with ISO 9001 prior to the start of construction for this Project. The ISO 9001 Certification shall apply to the facility, and to the design, fabrication, installation, and maintenance of the DMS. The facility where this company actually designs and manufactures the DMS shall be ISO 9001:2000 (or later) certified a minimum of one year prior to the start of construction.

2. Working drawings showing the sign housing and tilting brackets (if tilting brackets are used to achieve the required 3 degree sign face tilt) shall be sealed by an Engineer registered in the State of Colorado and shall be submitted in accordance with subsection 105.02. The sign housing shall be capable of withstanding a wind loading of 120 mph without permanent deformation or other damages. The sign housing shall also be designed and PE sealed to withstand current AASHTO specified group loading combinations.

3. Certification showing that welding of the DMS housing is in accordance with the American Welding Society (AWS) Standards, ANSI/AWS D1.2-97. The DMS manufacturer's welders and welding procedures shall be certified by an ANSI/AWS Certified Welding Inspector to the ANSI/AWS D1.2-97 Structural Welding Code for Aluminum.

4. Certification that all aluminum face materials have a coating that meets or exceeds the requirements of the American Architectural Manufacturers Association (AAMA) Specifications Publication No. 2605.

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REVISION OF SECTION 614
DYNAMIC MESSAGE SIGN (COLOR LED) (OVERHEAD)

5. Certification that the LEDs were tested and binned in accordance with the International Commission on Illumination (CIE) Standard Condition A.

6. Documentation and information on software as described in this document.

7. Documentation verifying the DMS is listed by an accredited 3rd party testing organization for conformance to UL48 and UL 1433.

8. All workmanship shall comply with IPC-A-610C, Class 2 titled "Acceptability of Electronic Assemblies".

9. Documentation providing proof printed circuit board (PCB) silicon conformal coating conformance to MIL-I-46058C Type SR and IPC-CC-830.

10. Documentation that the sign's structural integrity is in conformance with the current AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals.

11. Documentation that the DMS conforms to the transient protection and vibration of the National Electrical Manufacturer Association (NEMA) Standard TS4, Section2.

b. *Sign Housing.* All component parts shall be easily and readily accessible by a single person for inspection and maintenance. There shall be room for a technician to work. Access shall be made by entering both sides of the housing. The housing shall be weather tight, and compliant to the NEMA 3R Standard. The bottom panel of the housing shall have a minimum of four drain holes, with snap-in, drain filter plug inserts.

Any visible manufacturer's logo/trade name/reference on the DMS shall be placed on the bottom side of the access door or back panels of the DMS.

The sign housing shall be capable of withstanding a wind loading of 120 mph without permanent deformation or other damages. The sign housing shall also be designed, stamped and signed by a Professional Engineer to withstand current AASHTO specified group loading combinations including: sign weight, repair personnel and equipment, ice and wind loads. It shall also meet strength requirements for truck-induced gusts as specified in NCHRP Report 412. The sign housing shall be engineered to withstand snow loading of 40 pounds per square foot, as well as the ability to be mounted in a manner that prevents the buildup of snow and creates a natural means by which snow can run off without impeding flow of traffic. The performance of the sign, including the visibility and legibility of the display, shall not be impaired due to continuous vibration caused by wind, traffic or other factors. The housing shall be designed to accommodate mounting on the rear vertical plane and shall be structurally sufficient to be mounted to the sign support structure.

The LED DMS shall be built with a forward tilt angle of 3 degrees toward the viewing motorists. The sign housing and structural components for the tilting system if required by design shall be structurally sufficient to perform under all applicable loading conditions including gravity, wind, traffic, weather, roadway deicers, maintenance, and other environmental factors. Working drawings

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REVISION OF SECTION 614
DYNAMIC MESSAGE SIGN (COLOR LED) (OVERHEAD)

showing the sign housing shall be submitted in accordance with subsection 105.02. Working drawings shall be sealed and signed by an Engineer registered in the State of Colorado.

All parts shall be made of corrosion resistant materials, such as plastic, stainless steel or aluminum. Painted steel is not acceptable. No self-tapping screws shall be used. The exterior front face surfaces shall be finish coated by a system that meets or exceeds the AAMA Specification No. 2605. The finish shall be matte black. The main body of the sign housing shall be constructed of aluminum. All exterior seams shall be continuously welded by an inert gas process, except for the coated fascia material.

Each panel shall have a single polycarbonate sheet attached securely to the inside of the aluminum panel. The polycarbonate sheet shall cover all of the pixel openings. The polycarbonate shall be sealed to prevent water and other elements from entering the DMS. The polycarbonate shall contain UV inhibitors that protect the LED display matrix from the effects of ultraviolet light exposure and prevent premature aging of the polycarbonate itself. The use of a plastic lens system will not meet the requirements and will be cause for rejection. No louvers shall be allowed.

Polycarbonate sheets shall have the following characteristics:

- Tensile Strength, Ultimate: 10,000 PSI
- Tensile Strength, Yield: 9,300 PSI
- Tensile Strain at Break: 125%
- Tensile Modulus: 330,000 PSI
- Flexural Modulus: 330,000 PSI
- Impact Strength, Izod (1/8", notched): 17 ft-lbs/inch of notch
- Rockwell Hardness: M75, R118
- Heat Deflection Temperature Under Load: 264 PSI at 270F and 66 PSI at 288F
- Coefficient of Thermal Expansion: 3.9X10-5 in/in/F
- Specific Heat: 0.30 BTU/lb/F
- Initial Light Transmittance: 85% minimum
- Change in Light Transmittance, 3 years exposure in a Southern latitude: 3%
- Change in Yellowness Index, 3 years exposure in a Southern latitude: less than 5%

LED display modules shall mount to the inside of the DMS front face panels and be accessible from the inside of the sign housing only. No tools shall be needed for removal and replacement of LED display modules.

The external front face panels shall have the following minimum dimensions: The perimeter panels shall be a minimum of 12 inches wide. The external front face panels shall be thermally insulated from the rest of the sign housing. The glazing, aluminum mask and the external front face panels shall be easily replaceable from within the sign housing.

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REVISION OF SECTION 614
DYNAMIC MESSAGE SIGN (COLOR LED) (OVERHEAD)

The ventilation system shall be forced air. The system shall be designed to adequately cool the pixels from all sides along with the front and rear of the display module and all other internal components. The ventilation system shall have the following properties:

(1) Positive pressure (exhaust fans are not acceptable).

(2) The fans shall have ball or roller bearings, shall be permanently lubricated and shall require no periodic maintenance. The fans are to be positioned in such a manner so as to provide a balanced air flow to the ventilation system in the event of failure of any fan.

Access door shall be mounted to an integral doorframe, which mounts to the DMS housing using non-corrosive hardware. A continuous vertical stainless steel hinge shall support the door, and the door shall open outward towards the monotube structure. In the closed position, each door shall latch to its frame with a three-point draw- roller mechanism. The latching mechanism shall include an internal handle and release lever. Door release levers shall be located so that a person with no key and no tools cannot become trapped inside the housing.

Access doors shall be framed and swing open and lock in-place open at a 90 degree angle and 110 degree angle from the DMS housing end wall. The bottom edge of each door shall be at least 3.5-inches from the bottom edge of the DMS housing. This will provide clearance for the doors to swing open over external access platform.

The door will be fitted with an interior and exterior lockable heavy duty handle. Each Exterior door shall be furnished with a handle that is pad lock ready. Each door shall close around its flanged frame and compress against a closed-cell foam gasket, which adheres to the door. All doors shall contain a stop that retains the door in a 90 and 110-degree open position. When a door is open, the door and its stop shall withstand damage by a 60 mph wind gust.

The DMS must be equipped with an OSHA compliant safety rail assembly, which when closed across an open access door, prevents service personnel from falling out of the DMS. DMS shall have a rail assembly to be provided for each door in the display. The rail assembly shall require no tools to open and close.

The door shall incorporate an open/closed sensor that is detectable by the sign controller and notifies the central system control software whenever the door is accessed.

Minimum headroom of 72-inches shall be provided in the DMS housing. This free space shall be maintained across the entire width of the DMS housing, with the exception of structural frame members. Structural members shall be designed not to obstruct the free movement of maintenance personnel throughout the DMS interior.

A level aluminum walkway shall be installed in the bottom of the DMS housing. The walkway shall be a minimum of 24-inches wide and it shall run the entire length of the housing, from access door to access door. The walkway's top surface shall be non-slip and shall be free of obstructions that could trip service personnel. The walkway shall support a load of 300 pounds per linear foot.

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REVISION OF SECTION 614
DYNAMIC MESSAGE SIGN (COLOR LED) (OVERHEAD)

The internal structural members shall be extruded aluminum and shall accommodate both the display module mountings while allowing air distribution. The display modules shall be removed and replaced without the use of tools and without disturbing adjacent modules. The sign shall have heaters that are sufficient to elevate the temperature within the sign to 30° F above the temperature outside the sign. These heaters shall be controlled by a manually operated automatic shut-off timer in the sign and remotely from central computers.

The system power and communication lines shall each be protected by two stages of surge protection devices. The first stage shall be an arc discharge, gas discharge tube or a thyristor surge protection based unit with local and remote reporting capability. The second stage shall be metal oxide varistor (MOV) based. This second stage shall include a crowbar circuit, that when remotely enabled, shall trip the power circuit breaker when the second stage surge suppressor is activated. In both cases, tripping of each stage (or both if tripped simultaneously) of the surge protection and shall report the power surge condition to the sign controller for report to central. The crowbar shall be an option that is either enabled or disabled and is selected and downloaded from the central system control software to the sign controller. When this option is enabled, tripping of the second stage of surge protection shall prevent power from reaching any components of the sign until the surge protection has been replaced. When this option is disabled, the sign will continue to function normally after the second stage of surge protection is tripped.

c. *Sign controller.* The sign controller and associated communication equipment shall be installed inside the DMS equipment cabinet. Each DMS shall be controlled and monitored by its own sign controller. The sign controller shall be a stand-alone microprocessor-based system, which does not require continuous communication with DMS control software in order to perform most DMS control functions.

The sign controller shall meet the following operational requirements:

1. Communicate using embedded National Transportation Communications for ITS Protocol (NTCIP).
2. Contain memory for storing changeable and permanent messages, schedules, and other necessary files for controller operation.
3. Include a front panel user interface with graphical Vacuum Fluorescent Display (VFD) or LCD and keypad for direct operation and diagnostics as described herein.
4. Contain a minimum of three NTCIP-compliant RS232 communication ports.
5. Contain a minimum of one NTCIP-compliant Ethernet port with RJ45 connector.
6. Contain a minimum of one NTCIP-compliant RS422 communication port with RJ45 connector.
7. Have the ability to play volatile messages.
8. Contain DMS-specific control firmware (embedded software) that shall monitor all external and internal sensors and communication inputs and control the display modules as directed by external control software and the front panel interface.
9. Ability for remote firmware upgrades that error check to eliminate firmware corruption.

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REVISION OF SECTION 614
DYNAMIC MESSAGE SIGN (COLOR LED) (OVERHEAD)

NTCIP shall be natively supported in the DMS controller. External protocol converter or translator devices shall not be allowed.

The sign controller shall be programmed to receive and transmit NTCIP compliant sign control commands from the central system control software and laptop computer.

The controller shall have power-up and auto-restart capabilities with programmable default actions when recovering from a power off condition. A hardware watch dog circuit shall provide automatic reset of the controller and communications device. Central control shall have ability to perform a remote command for the controller and communications device reset. The controller shall be able to accept standard UPS shutdown commands via Ethernet or serial interface.

The Controller shall perform all communication, control and feedback functions and shall not require an intermediate control device and be the only sign controller. Communication and control lines between the sign controller and the system interface circuits shall be opto-coupled

d. *Cabinet.* The sign controller shall be installed in the DMS Equipment Cabinet. The cabinet shall be a Model 332D cabinet with dual-sided access, polycarbonate base and cast-in-place concrete pad.

The equipment cabinet shall be natural aluminum with anchor bolts in accordance with the FHWA-IP-78-16 specification. The cabinet shall include the following minimum requirements:

1. Two internal (front/back) fluorescent lamps.
2. Full-height standard Electronics Industry Alliance (EIA) 19-inch rack with a minimum of one pullout drawer.
3. Power panel board circuit breakers meeting the following minimum requirements.
4. Service entrance-rated.
5. Minimum of 12 circuit breaker mounting positions.
6. Short circuit rating of 22,000 amps for main and 10,000 amps branch circuits.
7. Underwriters' Laboratories (UL) Listed.
8. Two 15-amp NEMA 15-R 120VAC duplex outlet with one ground-fault circuit interrupter.
9. One earth ground lug that is electrically bonded to the cabinet.
10. One thermostatically controlled 100 cubic feet per minute (cfm) exhaust fan mounted near the top of the cabinet.
11. Filtered air intake ports with removable and replaceable fan and filter located on the bottom third of each access door.
12. Remote communication device.

A 19-inch rack mountable power conditioner shall be installed in the DMS equipment cabinet to provide – simultaneously- fully regenerated, conditioned power with true sine wave and continuous AC outputs to controllers, and communication devices.

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REVISION OF SECTION 614
DYNAMIC MESSAGE SIGN (COLOR LED) (OVERHEAD)

The following shall be mounted inside the cabinet:

1. NTCIP compliant DMS controller.

2. Fold-down laptop shelf and document holder for maintaining sign.

3. Ruggedized Ethernet switch or router with fiber uplink port and optics appropriate to the distance to the communications hub. The switch or router shall be capable of operating within the temperature range given for the DMS or have sufficient ventilation to stay within its manufacturer's specified temperature range. Adequate ports for system devices shall be provided plus at least two spare 100 Mbs ports.

4. Display system interface circuits.

5. Local/remote control switch.

6. RS-232 cable (a minimum of 4 feet long to connect the controller interface to a laptop computer) (7) A.C. surge protection and communication surge protection.

e. *Electronics.* All electronic components, except printed circuit boards, shall be commercially available, easily accessible, replaceable and individually removable using conventional electronics repair methods.

All printed circuit boards shall be sealed with a silicone conformal coating.

Components shall be arranged so they are easily accessible for testing and replacement. All circuit designs shall utilize high quality electronic components and shall provide a meantime before failure of at least 3 years.

The DMS shall contain an automatically controlled defog system that warms the DMS front face when the internal DMS relative humidity is near condensation levels. This system shall keep the front face polycarbonate panel free of fog and condensation. The heat generated by the defog system shall not damage any part of the DMS.

The sign and the controller shall be capable of operating with 120/240 VAC, 50 amp per leg, 60 Hz, single phase power. The sign shall have a power panel board with 50-amp two-pole breaker (common trip) main, 120/240

VAC, single phase, four wire load center with 20 circuit capability. Each circuit in the sign shall be powered from a circuit breaker. Inside the sign housing, all 120 VAC service lines shall be independently protected by a thermo magnetic circuit breaker at the sign housing entry point. All 120 VAC wiring shall be located in conduit, pull boxes, raceways, or control cabinets as required by the National Electrical Code (NEC). No 120 VAC wiring shall be exposed within or outside of the sign housing. The sign housing shall not be considered as a raceway or control cabinet. There shall be a minimum of three GFI Duplex outlets installed inside the sign housing.

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REVISION OF SECTION 614
DYNAMIC MESSAGE SIGN (COLOR LED) (OVERHEAD)

The DMS housing shall contain a minimum of one (1) compact fluorescent light (CFL) fixture for every eight (8) feet of DMS housing width. The lamps shall be evenly spaced across the housing ceiling and provide uniform light distribution for maintenance purposes. The light provided by the lamps shall meet the requirements of *ANSI/IESNA RP-7-01, Lighting Industrial Facilities*. Each lamp shall be rated for at least 10,000 hours of operation, have a minimum 30-watt rating, be self - ballasted, and be rated for cold weather operation down to -20º F. Lamp housing shall be heavy duty and enclosed to protect the lamps from damage. The lamps shall and have a color temperature of at least 4100ºK.

The brightness and color of each pixel shall be uniform over the entire face of the sign within the 30-degree cone of vision from minimum of 200 feet up to and including 1100 feet in all lighting conditions.

Sign brightness shall meet NEMA TS4-2005, Section 5, (12,400 cd/m2 minimum white brightness). The LED drive current shall be less than 30mA for Red and less than 15mA for Blue and Green.

The brightness of each LED shall be measured in accordance with CIE Standard Condition A, as described in CIE 127-2007, Technical Report: Measurement of LEDs.

Each LED module shall contain a printed circuit board to which LED pixels are soldered. The LED pixel matrix shall conform to the following specifications:

1. Each LED module shall contain approximately 256 LED pixels configured in a two dimensional array.

2. The pixel array shall be approximately 16 pixels high by 16 pixels wide.

3. The distance from the center of one pixel to the center of all adjacent pixels, both horizontally and vertically, shall be 32-34 mm.

4. Each pixel will contain a Red, Green, and Blue LED, each being independently driven.

5. The failure of an LED string or pixel shall not cause the failure of any other LED string or pixel in the DMS.

6. The base of the discrete LEDs shall be soldered such that the 30 degree field of view is consistent with field of view for the entire set of LEDs on the sign.

7. All LED pixel boards shall be identical and interchangeable throughout the DMS.

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REVISION OF SECTION 614
DYNAMIC MESSAGE SIGN (COLOR LED) (OVERHEAD)

Discrete LEDs

DMS pixels shall be constructed with discrete LEDs manufactured by a reputable manufacturer such as Avago Technologies (formerly Agilent Technologies), Nichia Corporation, OSRAM or EOI. Discrete LEDs shall conform to the following specifications:

1. All LEDs shall have a nominal viewing cone of 30 degree angle of 15 degrees measured from the center of the longitudinal viewing cone.
2. Color LEDs shall utilize AlInGaP semiconductor technology and shall emit light that has a peak wavelength of 590 ± 5 nm. Color LEDs shall utilize Red AlInGaP 626 nm, Green InGaN 525 nm and Blue InGaN 470 nm.
3. The LED packages shall be fabricated from UV light resistant epoxy.
4. The LED manufacturer shall perform intensity sorting of the bins. LEDs shall be obtained from no more than two consecutive luminous intensity "bins" as defined by the LED manufacturer.
5. The LED manufacturer shall perform color sorting of the bins. LEDs shall be obtained from no more than two consecutive color "bins" as defined by the LED manufacturer.
6. The various LED color and intensity bins shall be distributed evenly throughout the sign and shall be consistent from pixel to pixel. Random distribution of the LED bins shall not be accepted.
7. The LED manufacturer shall assure color uniformity and consistency on the LED display face within the 30 degree cone of vision and shall not have inconsistent color shifts.
8. LED package style shall be surface-mount or through-hole with or without standoffs.
9. All LEDs used in all DMS provided for this contract shall be from the same manufacturer and of the same part number, except for the variations in the part number due to the intensity and color.
10. The LEDs shall be rated by the LED manufacturer to have a minimum lifetime of 100,000 hours of continuous operation while maintaining a minimum of 70% of the original brightness.

Pixel Drive Circuitry

Each LED display module shall contain electronic driver circuitry that shall individually control all pixels on that module. The driver circuitry shall conform to the following specifications:

1. Each LED module shall be microprocessor-controlled and shall communicate with the sign controller on a wire or fiber optic communication network. The microprocessor shall process commands from the sign controller to display data, perform diagnostic tests, and report pixel and diagnostic status.
2. The LED driver shall compensate for color based on temperature and LED color changing characteristics.

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DYNAMIC MESSAGE SIGN (COLOR LED) (OVERHEAD)

3. Constant current LED driver ICs shall be used to prevent LED forward current from exceeding the LED manufacturer's recommended forward current whenever a forward voltage is applied. To maximize LED service life, LED drive currents will not be allowed that exceed the manufacturer's recommendations for the 100,000-hour lifetime requirement.
4. The LED driver shall utilize PWM (Pulse Width Modulation) of the drive current to vary the output intensity of each LED. The drive current pulse shall be modulated at a frequency high enough eliminate visible flickering from zero to full-brightness.
5. The LED driver circuitry shall receive updated display data at a minimum rate of ten (10) frames per second from the sign controller. Each LED driver circuit shall be powered by external regulated DC power supplies.
6. The voltage of each power input shall be measured to the nearest tenth of a volt and reported to the sign controller upon request. Each driver circuit shall also contain a status LED for the power source that indicates if the power source is present or not.
7. The LED driver circuitry shall be able to detect that individual LED strings or pixels are stuck off and shall report the pixel status to the sign controller upon request.
8. The LED driver circuit shall contain a seven segment numeric LED display that indicates the functional status of the LED pixel display module. At a minimum, it shall indicate error states of the LED pixels and communication network. The indicator shall be positioned such that a maintenance technician can easily view the status code for diagnostic purposes. The LED display module shall report the status, including pixel errors, voltage levels, etc. to the sign controller upon request.

Pixel power drawn from the DC supplies shall not exceed 1.5 watts per pixel, including the driving circuitry.

A minimum of 3 photocells shall be installed on the sign. These devices shall permit automatic light intensity measurement of light conditions at each sign location. These photocells shall be mounted in a manner to measure front, rear and ambient light conditions.

Provisions shall be made to prevent perceivable brightening of the sign due to stray headlights shining upon the photo sensors at night.

The sign shall be configured such that a UPS will be able to run all necessary control electronics, communication equipment, and the half of the pixels in the sign display in the event of a power failure.

Power supplies for the sign display shall be configured such that the failure of any one supply does not degrade functionality of the display and the display remains 100% functional.

All cables shall be securely clamped/tied in the sign housing. No adhesive attachments will be allowed.

The signs shall be capable of displaying ASCII characters 32 through 126 (including all upper and lower case letters and digits from 0 to 9) at any location in a message line.

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DYNAMIC MESSAGE SIGN (COLOR LED) (OVERHEAD)

The Contractor shall be responsible for locating the nearest electrical power and telephone sources and connecting those sources to the appropriate terminations with the DMS. The Contractor shall cooperate with the local electrical and telephone utilities to establish a service accounts at the direction of the Engineer.

f. *Control and Communication.* The sign controller shall be capable of being controlled from the central system control software via RS-232 serial and Ethernet communications.

The communications between the sign controller and the central system control software shall comply with the NEMA National Transportation Communications for ITS Protocol (NTCIP). The sign controller shall support all NTCIP conformance levels, conformance groups, objects, and minimum storage sizes and ranges as specified under the NTCIP Section listed in this Project Special Provision.

In addition to the standard Management Information Base (MIB) objects, the sign shall include any additional manufacturer-specific MIB objects required to support all of the sign and central software functionality defined in the speciation's and in the NTCIP Section found in this specification.

Protect low voltage communication lines (twisted pair or coaxial) with multi-stage one- pair or two-pair surge suppressors designed for high-exposure applications, providing common mode and differential mode protection, with a maximum clamping voltage of 10 volts greater than peak DC or maximum AC RMS signal voltage and peak surge current rating of 10kA.

The sign controller shall be capable of being remotely reset from the central system control software.

The sign shall provide a minimum of four input and four output contact closures able to receive digital and or analog signals that allow at least 15 message activations upon contact closure events. These message activations shall permit standard NTCIP operations to occur and also permit contact closure messages to occur without message activation collisions and or message activation errors. Contact closures shall be remotely accessible using standard NTCIP MIB objects. Contact closures shall be capable of issuing NTCIP traps.

The sign controller shall allow user-configuration of maximum and minimum temperature in which to turn fans on and off.

The sign shall have polling capability and at a minimum shall be capable of reporting the status of the following:

1. Pixel operational status that includes the state of every pixel

2. Sign and ambient temperature

3. DC power supply status

4. The current state (on or off) of each pixel, including any pixel errors, in the actual, currently displayed message without disturbing the message in any way. This shall be real time and shall not be based on a previous pixel test.

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5. Cooling fan status

6. Access door alarm

7. Communication failure log

8. UPS status

9. AC surge protector status

The controller software shall be capable of displaying the following types of messages:

1. Static messages capable of displaying any character or set of characters

2. Full Graphic capabilities.

3. Flashing messages with the following ranges of adjustable timing:

   (a) Message time on from 0.5 to 5.0 seconds in 0.1 second increments.

   (b) Message time off from 0.5 to 5.0 seconds in 0.1 second increments.

4. Alternating messages capable with the following ranges of adjustable timing:

   (a) Primary message time on from 0.5 to 5.0 seconds in 0.1 second increments.

   (b) Primary message time off from 0 to 5.0 seconds in 0.1 second increments.

   (c) Alternate message time on from 0.5 to 5.0 seconds in 0.1 second increments.

   (d) Alternate message time off from 0 to 5.0 seconds in 0.1 second increments.

5. Capability to do Text rectangles, Background colors, Foreground Colors, Support 24 Bit Color Scheme as specified by NTCIP 1203 v2

It shall be possible to flash any character or set of characters in an alternating message at the adjustable frequencies listed above for flashing messages. The flashing period shall be a sub-multiple of the associated alternating on time. It shall also be possible to flash any character or set of characters in a static message. The sign controller shall monitor the photo cell circuits in the sign and convert the measured light intensity into the desired pixel brightness.

g. *UPS System.* The UPS system shall provide "On-Line" dual conversion control.

The UPS shall be rated per the following:

Input Voltage	85 VAC to 135 VAC
Input Frequency	48 to 62 Hz
Output Voltage	120 VAC +/- 3%

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Output Frequency	60 Hz
Power	VA required to run color DMS sign control electronics, communication equipment, and half of the pixels in the LED sign face with all LED illuminated at day time brightness levels, allowing for sign functionality during a power outage for a minimum of 8 hours

The unit will be designed for a hot swap of components and shall not compromise existing DMS wiring. The unit shall provide for RS232 communication and contact closures for alarm functions. The unit shall be temperature rated to operate from 0 degree C to +40 degree C.

The UPS system shall be capable of producing simultaneously-fully regenerated, conditioned power with true sine wave and continuous AC outputs with stand by capability.

The unit shall have a re-settable power event counter to record the number of power utility failures, a battery run- time counter and temperature compensated battery charging.

The UPS System shall be capable of providing continuous, fully conditioned (both voltage and frequency), regulated, sinusoidal (AC) power to selected devices such as controllers, modems, 5 volt power supplies, and sign face drivers.

Wiring shall comply with national electrical code (NEC) standards and approved wiring methods. Properly rated SO/SJO cords shall be allowed to allow easy replacement of the UPS System.

The UPS shall be 19-inch rack mountable and shall be accompanied with 19-inch rack mountable aluminum battery shelves for installation in the DMS Equipment Cabinet (Type 2).

The UPS shall consist of two major components, the electronics module and the battery system.

1. The electronics module shall consist of the following:

   A. True Sine wave, high frequency inverter

   B. Minimum 3-stage, temperature compensated, battery charger

   C. For connection from the electronics module to the battery system, a dedicated harness shall be provided with quick-release, keyed, circular connectors, and braided nylon sleeving over all conductors.

   D. Local and remote control of UPS functions

   E. Local and remote communications capabilities

2. The battery system shall consist of the following:

   A. Shall run sign electronics, communication equipment, and half of the pixels in the sign face with all LEDs illuminated at daytime brightness levels, for a minimum of 8 hours.

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B. The batteries shall be comprised of extreme temperature, deep cycle Absorbed Glass Mat/Valve Regulated Lead Acid (AGM/VRLA) batteries that have been field proven and tested by the U.S. military.

C. Batteries shall be certified to operate at extreme temperatures from -40'C to +74'C.

D. The batteries shall be provided with appropriate interconnect wiring and a corrosion-resistant mounting trays and/or brackets appropriate for the location into which they will be installed.

E. The interconnect cable shall be protected with abrasion-resistant nylon sheathing.

F. Battery construction shall include heavy-duty, inter-cell connections for low-impedance between cells and heavy-duty plates to withstand shock and vibration.

The UPS System shall come standard with software, RS232 interface via a DB-9F connector (optional SNMP Adapter for TCP/IP protocols) allowing full, interactive, remote computer monitoring and control of the UPS functions. The software shall allow the user to set up all operational parameters either locally or remotely and test the functionality of the unit.

The UPS alarm function monitoring shall come standard with a DB-9F connector with open collectors (40 V @ 20 mA) indicating:

1. Loss of utility power
2. Inverter failure
3. Low battery

The UPS front panel controls shall come standard with Power ON, Cold (DC) Start, Alarm Silence, Battery Test, Bypass Breaker and DC/Battery Breaker.

Reliability shall be calculated with mean time between failure (MTBF) of 100,000 hours based on component ratings.

The DMS equipment cabinet shall be used to house the UPS system along with the equipment for the overhead DMS and lane use signs.

MANUFACTURER QUALIFICATIONS

The manufacturer shall supply experience documentation showing that the manufacturer has been in business, under the current corporate name, designing and manufacturing Interstate DYNAMIC MESSAGE SIGN (COLOR LED) (OVERHEAD)s for a minimum of 5 years; and that the manufacturer has in operation a minimum of 50 walk-in DMSs 1 of which being COLOR DMSs and NTCIP compliant.

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DYNAMIC MESSAGE SIGN (COLOR LED) (OVERHEAD)

CONSTRUCTION REQUIREMENTS

Contractor shall be fully responsible for the delivery of the DMSs and sign controllers to the installation site and any damages that occur in the installation delivery process.

The DMS shall be installed in accordance with manufacturer's recommendations. A qualified factory representative shall be available on site to ensure proper installation and testing.

See project specific Testing & Integration Plan for additional requirements for DMSs.

A minimum of five copies of the operations manual detailing the electrical schematics, operation and maintenance of the DMS system, including spare software copies, shall be provided. Additional copies may be requested by the Engineer. One copy of the manual shall remain inside the sign housing or control cabinet. One copy shall be mailed to the Colorado Transportation Management Center at 425 C Corporate Circle, Golden, Colorado 80401.

The manufacturer shall provide 8 hours of class room training for CDOT at the CTMC in Golden, CO. The manufacturer shall supply 8 hours of on-site training in the sign for the CTMC staff.

The CTMS integrator shall be responsible for developing any graphics for the DMS and will provide to the Contractor or sign manufacturer. The Contractor or sign manufacturer shall request the graphics from the CTMS integrator 30 Calendar Days in advance and shall pre-load all graphics onto the signs.

Uninterruptible Power Supply System

The UPS and batteries shall be installed in the DMS equipment cabinet which shall also house control equipment for lane use signs and side-mounted variable message signs. Contractor shall provide detailed design and installation plans for Engineer Approval prior to installation. Power feeding the sign shall first terminate in the ground mounted cabinet. Non-UPS power shall pass through the cabinet to power non-UPS loads. Power required for sign backup shall feed through the UPS system. A bypass switch, rated for the designed system, shall be installed to bypass the UPS in the event of UPS failure or for system maintenance. A disconnect switch shall also be installed to disconnect UPS and line power from the sign. The Contractor shall install the DMS UPS output into the DMS power distribution panel per sign manufacture recommendations. Serial and Ethernet cables shall be installed from the UPS system ground cabinet to the sign communication device location. All wiring shall conform to the latest version of the NEC.

Work includes furnishing, delivery to the site, and installation of DMS Equipment Cabinet and associated cabinet foundation, installing the power panel board and all associated electrical connections within the DMS housing. Work includes furnishing, installing and making all electrical connections for the main service power disconnect located on the sign structure near the access control cabinet. All costs associated with having a manufacturer's representative shall be included in the work. Work includes training and the purchasing of manuals.

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DYNAMIC MESSAGE SIGN (COLOR LED) (OVERHEAD)

NTCIP Section

This portion of the specification defines the detailed NTCIP requirements for the LED DMS covered by the Project specifications. This specification references several standards through their NTCIP designated names. The following list provides the full reference to the current version of each of these standards. In many cases, the standard is more widely known by its original NEMA assigned number, in these cases, the NEMA number is also identified. The content of the NEMA standard is identical to that of the NTCIP standard.

Each NTCIP component covered by these Project specifications shall follow the most recent version of the standard that is at the stage of recommended or higher, including any and all Approved or Recommended Amendments to these standards as of the same date. It is the ultimate responsibility of the Contractor to monitor NTCIP updates.

General Requirements:

Subnet Level
NTCIP components may support additional Subnet Profiles at the vendor's option. At any one time, only one Subnet Profiles shall be active on a given serial port of the NTCIP Component. If the NTCIP Component has a serial port that supports multiple Subnet Profiles, the NTCIP Component shall be configurable to allow the field technician to activate the desired Subnet Profile and shall provide a visual indication of the currently selected Subnet Profile.

Transport Level
Each NTCIP Component shall comply with NTCIP 2202, (NEMA TS 3.Internet). NTCIP Components may support additional Transport Profiles at the manufacturer's option. Response datagrams shall use the same Transport Profile used in the request. Each NTCIP Component shall support the receipt of datagrams conforming to any of the identified Transport Profiles at any time.

Application Level
Each LED DMS shall comply with NTCIP 2301, (NEMA TS 3.AP-STMF), as a Managed Agent and shall meet the requirements for Conformance Level 1 (NOTE – See Amendment to standard). Simple network management protocol (SNMP) shall be required and simple transportation management protocol (STMP) shall not be required. An NTCIP Component may support additional Application Profiles at the manufacturer's option. Responses shall use the same Application Profile used by the request. Each NTCIP Component shall support the receipt of Application data packets at any time allowed by the subject standards.

Information Level
Each NTCIP Component shall provide Full, Standardized Object Range Support of all objects required by these procurement specifications, unless otherwise indicated below. The maximum Response Time for any object or group of objects shall be 200 milliseconds.

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The vendor's software shall implement all mandatory objects of the mandatory conformance group defined in NTCIP 1201, (NEMA TS 3.4) Global Object Definitions:

Configuration Conformance Group – Section 3.1
Security Conformance Group (new in Amendment 1)

The vendor's software shall implement the mandatory objects of the optional conformance groups defined in NTCIP 1201, (NEMA TS 3.4), Global Object Definitions:

Time Management Conformance Group – Section 3.3
TimeBase Event Schedule Conformance Group – Section 3.4
Report Conformance Group – Section 3.5

The vendor's software shall implement all mandatory objects of all mandatory conformance groups defined in NTCIP 1203, (NEMA TS 3.6) Object Definitions for DYNAMIC MESSAGE SIGN (LED) (OVERHEAD):

Sign Configuration Conformance Group – Section 4.1
Message Table Conformance Group – Section 4.6
Sign Control Conformance Group – Section 4.7

The vendor's software shall implement all mandatory objects of the optional conformance groups defined in NTCIP 1203, (NEMA TS 3.6), Object Definitions for DYNAMIC MESSAGE SIGN (LED) (OVERHEAD):

GUI Appearance – Section 4.2
Font Definition – Section 4.3
DMS Sign Configuration – Section 4.4
MULTI Configuration – Section 4.5
Default Message – Section 4.8
MULTI Error – Section 4.10
Illumination/Brightness – Section 4.11
Scheduling – Section 4.12
Auxiliary I/O – Section 4.13
Sign Status – Section 4.14
Status Error – Section 4.15
Pixel Error Status – Section 4.16
Fan Error Status – Section 4.18
Temperature Status – Section 4.17

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DYNAMIC MESSAGE SIGN (COLOR LED) (OVERHEAD)

The vendor's software shall implement the following optional objects defined in NTCIP 1203, (NEMA TS 3.6):

dmsMessageBeacon – Section 2.6.1.1.1.8.6
dmsSWReset – Section 2.7.1.1.1.1
dmsMessageTimeRemaining – Section 2.7.1.1.1.4
dmsShortPowerRecoveryMessage – Section 2.7.1.1.1.8
dmsLongPowerRecoveryMessage – Section 2.7.1.1.1.9
dmsShortPowerLossTime – Section 2.7.1.1.1.10
dmsResetMessage – Section 2.7.1.1.1.11
dmsCommunicationsLossMessage – Section 2.7.1.1.1.12
dmsTimeCommLoss – Section 2.7.1.1.1.13
dmsPowerLossMessage – Section 2.7.1.1.1.14
dmsEndDurationMessage – Section 2.7.1.1.1.15
dmsMultiOtherErrorDescription – Section 2.7.1.1.1.20
dmsStatDoorOpen – Section 2.11.1.1.1.6
fanFailures – Section 2.11.2.1.1.8
fanTestActivation – Section 2.11.2.1.1.9
tempMinCtrlCabinet – Section 2.11.4.1.1.1
tempMaxCtrlCabinet – Section 2.11.4.1.1.2
tempMinAmbient – Section 2.11.4.1.1.3
tempMaxAmbient – Section 2.11.4.1.1.4
tempMinSignHousing – Section 2.11.4.1.1.5
tempMaxSignHousing – Section 2.11.4.1.1.6

The vendor's software shall implement the following tags (opening and closing where defined) of MULTI as defined in NTCIP 1203, (NEMA TS 3.6), Object Definitions for DYNAMIC MESSAGE SIGN (COLOR LED) (OVERHEAD):

MULTI Tag

1 Field
2 Flash
3 Font
4 Hexadecimal Character
5 Justification Line
6 Justification Page
7 Moving Text
8 New Line
9 New Page
10 Page Time
11 Spacing – Character

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The Field Tag shall support the following field ID's:

Field Tag ID	Description
1	1 Time, 12-hour format (no AM/PM indicator)
2	2 Time, 24-hour format
3	3 Temperature in degrees Celsius
4	4 Temperature in degrees Fahrenheit
5	7 Day of week
6	8 Day of month
7	9 Month of year
8	10 Year, 2-digits
9	11 Year, 4-digits

Sizes and Ranges

All objects required by these procurement specifications shall support all values within its standardized range. The standardized range is defined by a size, range, or enumerated listing indicated in the object's SYNTAX field and/or through descriptive text in the object's DESCRIPTION field of the relevant standard. The following provides the current listing of known variances for this Project:

Object	Reference	Minimum Project Requirements
NTCIP 1201 (TS 3.4)		
moduleTableEntry	2.2.3	Shall contain at least one row with module Type equal to 3 (software). The module Make shall specify the name of the manufacturer, the module Model shall specify the manufacturer's name of the component and the model Version shall indicate the model version number of the component.
communityNamesMax	2.8.2	Shall be at least 4.
maxTimeBaseScheduleEntries	2.4.3.1	7
maxDayPlans	2.4.4.1	7
maxDayPlanEvents	2.4.4.2	7
maxEventLogConfigs	2.5.1	50
eventConfigMode	2.5.2.3	2, 3, and 4
maxEventLogSize	2.5.3	200
maxEventClasses	2.5.5	7
maxGroupAddress	2.7.1	1
NTCIP 1203 (TS 3.6)		
dmsNumPermanentMsg	2.6.1.1.1.1	50
dmsMaxChangeableMsg	2.6.1.1.1.3	50
dmsFreeChangeableMemory	2.6.1.1.1.4	50KB
dmsMaxVolatileMsg	2.6.1.1.1.6	50
dmsFreeVolatileMemory	2.6.1.1.1.7	50KB
dmsMsgMultiString	2.6.1.1.1.8.3	See attached table
dmsControlMode	2.7.1.1.1.1	2,4,5

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numFonts	2.4.1.1.1.1	4
maxFontCharacters	2.4.1.1.1.3	127
DMSCharacterHeightPixels	2.3.1.1.1.1	5
DMSCharacterWidthPixels	2.3.1.1.1.2	7
DMSSignHeightPixels	2.3.1.1.1.3	3
DMSSignWidthPixels	2.3.1.1.1.4	10
DMSHorizontalPitch	2.3.1.1.1.5	32-35mm
DMSVerticalPitch	2.3.1.1.1.6	32-35mm
defaultBackgroundColor	2.5.1.1.1.1	0 (black)
defaultForegroundColor	2.5.1.1.1.2	9 (amber)
defaultJustificationLine	2.5.1.1.1.6	2,3,4
defaultJustificationPage	2.5.1.1.1.7	2,3,4
defaultFlashOn	2.5.1.1.1.3	0.5 to 5.0
defaultFlashOff	2.5.1.1.1.4	0.5 to 5.0
defaultPageOnTime	2.5.1.1.1.8	0.5 to 5.0
defaultPageOffTime	2.5.1.1.1.9	0.5 to 5.0
defaultCharacterSet	2.5.1.1.1.10	eightBit (2)
numActionTableEntries	2.9.1.1.1.1	15

Documentation

Manufacturer shall supply software shall be supplied with full, electronic documentation containing American Standard Code for Information Interchange (ASCII) versions of the following Management Information Base (MIB) files in Abstract Syntax Notation 1 (ASN.1) format:

- The relevant version of each official standard MIB Module referenced by the device functionality.
- If the device does not support the full range of any given object within a Standard MIB Module, a vendor specific version of the official Standard MIB Module with the supported range indicated in ASN.1 format in the SYNTAX and/or DESCRIPTION fields of the associated OBJECT TYPE macro. The filename of this file shall be identical to the standard MIB Module, except that it will have the extension ".man".
- A MIB Module in ASN.1 format containing any and all manufacturer-specific objects supported by the device with accurate and meaningful DESCRIPTION fields and supported ranges indicated in the SYNTAX field of the OBJECT-TYPE macros.
- A MIB containing any other objects supported by the device.

The vendor shall allow the use of any and all of this documentation by any party authorized by CDOT for systems integration purposes at any time initially or in the future, regardless of what parties are involved in the systems integration effort.

REVISION OF SECTION 614
DYNAMIC MESSAGE SIGN (AMBER)

Section 614 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

This work consists of furnishing and installing a Light Emitting Diode Dynamic Message Sign (DMS) (Amber) and associated equipment cabinets. The sign shall be fully compatible with the mounting hardware and support structure shown on the plans.

MATERIALS

The DMS (Amber) shall be equipped with the ability to display three lines of 18-inch tall characters and shall have a display made up of a full matrix configuration. The sign shall have a 66-70 millimeter pixel pitch. All LEDs shall have a viewing angle of 30 degrees.

The sign shall be 18 feet wide by 8.5 feet tall by 4 feet deep with an allowable variation of plus or minus 7 inches. The sign shall include a power shut off mounted to the sign structure near the controller interface cabinet. The sign shall be capable of operating without any decrease in performance over a temperature range of -34° F to +140° F with a relative humidity of 0 to 99 percent, non-condensing. The sign shall have a minimum design life of 20 years.

(a) *Certifications*
Prior to start of the installation of the DMS (Amber) the Contractor shall provide the following certifications to the Engineer for review and Approval:

(1) Certification showing that the manufacturer of the DMS (Amber) is fully compliant with ISO 9001 prior to the start of construction for this project. The ISO 9001 Certification shall apply to the facility, and to the design, fabrication, installation, and maintenance of the DMS (Amber). The facility where this company actually designs and manufactures the DMS (Amber) shall be ISO 9001:2000 certified a minimum of one year prior to the start of construction.
(2) Working drawings showing the sign housing and tilting brackets (if tilting brackets are used to achieve the required 3 degree sign face tilt) shall be sealed by an Engineer registered in the State of Colorado and shall be submitted in accordance with subsection 105.02.
(3) Certification showing that welding of the DMS (Amber) housing is in accordance with the American Welding Society (AWS) Standards, ANSI/AWS D1.2-97. The DMS (Amber) manufacturer's welders and welding procedures shall be certified by an ANSI/AWS Certified Welding Inspector to the ANSI/AWS D1.2-97 Structural Welding Code for Aluminum.
(4) Certification that all aluminum face materials have a coating that meets or exceeds the requirements of the American Architectural Manufacturers Association (AAMA) Specifications Publication No. 2605.
(5) Certification that the LEDs were tested and binned in accordance with the CIE Standard Condition A.
(6) Documentation and information on software as described in National Transportation Communications for Intelligent Transportation System Protocol (NTCIP) Section within this specification.
(7) Documentation verifying the DMS is listed by an accredited 3rd party testing organization for conformance to UL 48 and UL 1433.
(8) All workmanship shall comply with IPC-A-610C, Class 2 titled "Acceptability of Electronic Assemblies."

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REVISION OF SECTION 614
DYNAMIC MESSAGE SIGN (AMBER)

(9) Documentation providing proof printed circuit board (PCB) silicon conformal coating conformance to MIL-I-46058C Type SR and IPC-CC-830
(10) Documentation that the sign's structural integrity is in Conformance to AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals (Current Edition).
(11) Documentation that the DMS conforms to the Transient Protection and Vibration of the NEMA Standard TS4, Section2.

(b) *Sign Housing*
All component parts shall be easily and readily accessible by a single person for inspection and maintenance. There shall be room for a technician to work. Access shall be made by entering the side of the housing. The housing shall be weather tight, and compliant to the NEMA 3R Standard. The bottom panel of the housing shall have a minimum of four drain holes, with snap-in, drain filter plug inserts. Any visible manufacturer's logo/trade name/reference on the DMS shall be placed on the bottom side of the access door or back panels of the DMS.

The sign housing shall be capable of withstanding wind loads of 120 mph without permanent deformation or other damage, withstand current AASHTO specified group loading combinations that include: sign weight, repair personnel and equipment, ice and wind. Design shall meet strength requirements for truck-induced gusts as specified in NCHRP Report 412. The sign housing design and working drawings shall be sealed and signed by an Engineer registered in the State of Colorado and submitted in accordance with CDOT Standard Specification 105.02.

The sign housing shall be engineered to withstand snow loading of 40 pounds per square foot, as well as the ability to be mounted in a manner that prevents the buildup of snow and creates a natural means by which snow can run off without impeding flow of traffic. The performance of the sign, including the visibility and legibility of the display, shall not be impaired due to continuous vibration as a result of wind, traffic or other factors. The housing shall be designed to accommodate mounting on the rear vertical plane and shall be structurally sufficient to be mounted to the sign support structure.

The DMS (Amber) shall be built with a forward tilt angle of three degrees toward the viewing motorists. The sign housing and structural components for the tilting system and vertical mounting bracket if required by design shall be structurally sufficient to perform under all applicable loading conditions including gravity, wind, traffic, weather, roadway deicers, maintenance, and other environmental factors. .

All parts shall be made of corrosion resistant materials, such as plastic, stainless steel or aluminum. Painted steel is not acceptable. No self-tapping screws shall be used. The exterior front face surfaces shall be finish coated by a system that meets or exceeds the AAMA Specification No. 2605. The finish shall be matte black. The main body of the sign housing shall be constructed of aluminum with a natural mill finish. All exterior seams shall be continuously welded by an inert gas process, except for the coated fascia material.

Each panel shall have a single polycarbonate sheet attached securely to the inside of the aluminum panel. The polycarbonate sheet shall cover all of the pixel openings. The polycarbonate shall be sealed to prevent water and other elements from entering the DMS. The polycarbonate shall contain UV inhibitors that protect the LED display matrix from the effects of ultraviolet light exposure and prevent premature aging of the polycarbonate itself. The use of a plastic lens system will not meet the requirements and will be cause for rejection. No louvers shall be allowed.

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REVISION OF SECTION 614
DYNAMIC MESSAGE SIGN (AMBER)

Polycarbonate sheets shall have the following characteristics:

(1) Tensile Strength, Ultimate: 10,000 pounds per square inch
(2) Tensile Strength, Yield: 9,300 pounds per square inch
(3) Tensile Strain at Break: 125 percent
(4) Tensile Modulus: 330,000 pounds per square inch
(5) Flexural Modulus: 330,000 pounds per square inch
(6) Impact Strength, Izod (1/8", notched): 17 ft-lbs per inch of notch
(7) Rockwell Hardness: M75, R118
(8) Heat Deflection Temperature Under Load: 264 pounds per square inch at 270°F and 66 pounds per square inch at 288°F
(9) Coefficient of Thermal Expansion: 3.9 by 10-5 in per in per °F
(10) Specific Heat: 0.30 British Thermal Units per lb per °F
(11) Initial Light Transmittance: 85 percent minimum
(12) Change in Light Transmittance, three years exposure in a Southern latitude: 3 percent
(13) Change in Yellowness Index, three years exposure in a Southern latitude: less than 5 percent

LED display modules shall mount to the inside of the DMS front face panels and be accessible from the inside of the sign housing only. No tools shall be needed for removal and replacement of DMS display modules.

The external front face panels shall have the following minimum dimensions: The perimeter panels shall be a minimum of 12 inches wide. The external front face panels shall be thermally insulated from the rest of the sign housing. The glazing, aluminum mask and the external front face panels shall be easily replaceable from within the sign housing.

The ventilation system shall be forced air. The system shall be designed to adequately cool the pixels from all sides along with the front and rear of the display module and all other internal components. The ventilation system shall have the following properties:

(1) Positive pressure (exhaust fans are not acceptable).
(2) The fans shall have ball or roller bearings, shall be permanently lubricated and shall require no periodic maintenance. The fans are to be positioned in such a manner so as to provide a balanced air flow to the ventilation system in the event of failure of any fan.

Access door shall be mounted to an integral doorframe that mounts to the DMS housing using non-corrosive hardware. A continuous vertical stainless steel hinge shall support the door, and the door shall open outward towards the monotube structure. In the closed position, each door shall latch to its frame with a three-point draw-roller mechanism. The latching mechanism shall include an internal handle and release lever. Door release levers shall be located so that a person with no key and no tools cannot become trapped inside the housing.

Access doors shall be framed and swing open and lock in-place open at a 90 degree angle and 110 degree angle from the DMS housing end wall. The bottom edge of each door shall be at least 3.5 inches from the bottom edge of the DMS housing. This will provide clearance for the doors to swing open over external access platform.

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The door will be fitted with an interior and exterior lockable heavy duty handle. Each exterior door shall be furnished with a handle that is pad lock ready and Corbin #2 key lock. Each door shall close around its flanged frame and compress against a closed-cell foam gasket, which adheres to the door. All doors shall contain a stop that retains the door in a 90 and 110-degree open position. When a door is open, the door and its stop shall withstand damaged by a 60 mph wind gust.

The DMS shall be equipped with an OSHA compliant safety rail assembly that when closed across an open access door will prevent service personnel from falling out of the DMS. The DMS shall have a rail assembly provided for each door in the display. The rail assembly shall require no tools to open and close.

The door shall incorporate an opened/closed sensor that is detectable by the sign controller and notifies the central system control software whenever the door is accessed.

Minimum headroom of 72 inches shall be provided in the DMS housing. This free space shall be maintained across the entire width of the DMS housing, with the exception of structural frame members. Structural members shall be designed not to obstruct the free movement of maintenance personnel throughout the DMS interior.

A level aluminum walkway shall be installed in the bottom of the DMS housing. The walkway shall be a minimum of 24 inches wide and it shall run the entire length of the housing, from access door to access door. The top surface of the walkway shall be non-slip and shall be free of obstructions that could trip service personnel. The walkway shall support a load of 300 pounds per linear foot.

The internal structural members shall be extruded aluminum and shall accommodate both the display module mountings while allowing air distribution. The display modules shall be removed and replaced without the use of tools and without disturbing adjacent modules. The sign shall have in cabinet heaters that are sufficient to elevate the temperature within the sign to 30° F above the temperature outside the sign. These heaters shall be controlled by a manually operated automatic shut-off timer in the sign and remotely from central computers.

The system power and communication lines shall each be protected by two stages of surge protection devices. The first stage shall be an arc discharge, gas discharge tube or a thyristor surge protection based unit with local and remote reporting capability. The second stage shall be metal oxide varistor (MOV) based. This second stage shall include a crowbar circuit, that when remotely enabled, shall trip the power circuit breaker when the second stage surge suppressor is activated. In both cases, tripping of each stage (or both if tripped simultaneously) of the surge protection and shall report the power surge condition to the sign controller for report to central. The crowbar shall be an option that is either enabled or disabled and is selected and downloaded from the central system control software to the sign controller. When this option is enabled, tripping of the second stage of surge protection shall prevent power from reaching any components of the sign until the surge protection has been replaced. When this option is disabled, the sign will continue to function normally after the second stage of surge protection is tripped.

(c) *Sign controller*

The sign controller and associated communication equipment shall be installed inside the DMS sign housing or roadside communications cabinet as shown on the plans. Each DMS shall be controlled and monitored by its own sign controller. The sign controller shall be a stand-alone microprocessor-based

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system, which does not require continuous communication with DMS control software in order to perform most DMS control functions.

The sign controller shall meet the following operational requirements:

(1) Communicate using embedded NTCIP protocol
(2) Contain memory for storing changeable and permanent messages, schedules, and other necessary files for controller operation
(3) Include a front panel user interface with graphical vacuum fluorescent display (VFD) or liquid crystal display (LCD) and keypad for direct operation and diagnostics as described herein
(4) Contain a minimum of three NTCIP-compliant RS232 communication ports
(5) Contain a minimum of one NTCIP-compliant Ethernet port with RJ45 connector
(6) Contain a minimum of one NTCIP-compliant RS422 communication port with RJ45 connector
(7) Have the ability to play volatile messages
(8) Contain DMS-specific control firmware (embedded software) that shall monitor all external and internal sensors and communication inputs and control the display modules as directed by external control software and the front panel interface
(9) Ability for remote firmware upgrades that error check to eliminate firmware corruption

NTCIP shall be natively supported in the DMS controller. External protocol converter or translator devices shall not be allowed.

The sign controller shall be programmed to receive and transmit NTCIP compliant sign control commands from the central system control software and laptop computer.

The controller shall have power-up and auto-restart capabilities with programmable default actions when recovering from a power off condition. A hardware watch dog circuit shall provide automatic reset of the controller and communications device. Central control shall have ability to perform a remote command for the controller and communications device reset. The controller shall be able to accept standard uninterruptable power supply (UPS) shutdown commands via Ethernet or serial interface.

The Controller shall perform all communication, control and feedback functions and shall not require an intermediate control device and be the only sign controller. Communication and control lines between the sign controller and the system interface circuits shall be opto-coupled.

The following shall be mounted inside the main sign housing:

(1) NTCIP compliant DMS controller (or as shown on the plans)
(2) Fold-down laptop shelf and document holder for maintaining sign.
(3) Hardened communication device
(4) Display system interface circuits
(5) Local/remote control switch
(6) Sign to ground voice communication RJ-11 jack
(7) Universal serial bus (USB) plug-in connection or a serial connection with a USB converter cable for the controller interface.
(8) RS-232 cable (a minimum of 4 feet long to connect the controller interface to a laptop computer)
(9) AC surge protection and communication surge protection

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There shall be an outside controller interface box that shall be made of aluminum or stainless steel, be weather tight, corrosion resistant, and meet NEMA 3R standards. The separate controller interface box shall be mounted as indicated on the plans. This typically will be on the sign support structure pole furthest from traffic.

The controller interface cabinet shall contain the following assemblies:

(1) Fold-down laptop shelf and document holder
(2) Power-on indicator
(3) Waterproof local/remote switch
(4) Local control LED indicator
(5) RS-232 cable a minimum of 4 feet long to connect the controller interface to a laptop computer.
(6) 120- volts alternating current (VAC) ground-fault interrupter (GFI) outlet
(7) For dialup installations, an RJ-11 jack for connecting the dialup phone line shall be installed with in-line surge protection.

The manufacturer shall provide the latest version of the server and maintenance version of the DMS control software.

(d) *Electronics*

All electronic components, except printed circuit boards, shall be commercially available, easily accessible, replaceable and individually removable using conventional electronics repair methods.

All printed circuit boards shall be sealed with a silicone conformal coating.

Components shall be arranged so they are easily accessible for testing and replacement. All circuit designs shall utilize high quality electronic components and shall provide a meantime before failure of at least 3 years.

The DMS shall contain an automatically controlled defog system that warms the DMS front face when the internal DMS relative humidity is near condensation levels. This system shall keep the front face polycarbonate panel free of fog and condensation. The heat generated by the defog system shall not damage any part of the DMS.

The sign and the controller shall be capable of operating with 120/240 Volts Alternating Current (VAC), 38 to 50 amps per leg, 60 hertz (Hz), single phase power. The sign shall have a 50-amp two-pole breaker (common trip) main, 120/240 VAC, single phase, four wire load center with 20 circuit capability. Each circuit in the sign shall be powered from a circuit breaker. Inside the sign housing, all 120 VAC service lines shall be independently protected by a thermo magnetic circuit breaker at the sign housing entry point. All 120 VAC wiring shall be located in conduit, pull boxes, raceways, or control cabinets as required by the National Electrical Code (NEC). No 120 VAC wiring shall be exposed within or outside of the sign housing. The sign housing shall not be considered as a raceway or control cabinet. There shall be a minimum of three GFI Duplex outlets installed inside the sign housing.

Lighting shall be provided to illuminate the interior of the sign. The lights shall be enclosed in die cast aluminum safety fixtures with twist-on bulb guards secured by a minimum of 4 set- screws. The lights shall be controlled by an adjustable timer.

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The DMS housing shall contain a minimum of one long life LED light fixture for every 8 feet of DMS housing width. The lamps shall be evenly spaced across the housing ceiling and provide uniform light distribution for maintenance purposes. The light provided by the lamps shall meet the requirements of *ANSI/IESNA RP-7-01, Lighting Industrial Facilities*. Each lamp shall be rated for at least 10,000 hours of operation, have a minimum 30-watt rating, be self -ballasted, and be rated for cold weather operation down to -20º F. Lamp housing shall be heavy duty and enclosed to protect the lamps from damage. The lamps shall and have a color temperature of at least 4100ºK.

The pixels shall be amber in color and utilize precision optical performance AlInGaP II LEDs constructed of aluminum indium gallium phosphide. The brightness and color of each pixel shall be uniform over the entire face of the sign.

The brightness and color of each pixel shall be uniform over the entire face of the sign within the 30-degree cone of vision from minimum of 200 feet up to and including 1100 feet in all lighting conditions. The brightness of each LED shall be measured in accordance with CIE Standard Condition A, as described in CIE 127-2007, Technical Report: measurement of LEDs.

The pixel strings shall be powered from a regulated direct current (DC) power source and the LED current shall be maintained at 25 plus or minus three milliamperes per string to maximize life of the pixel. The failure of an LED in one string within a pixel shall not affect the operation of any other string or pixel. The LEDs shall be capable of operating in a temperature range of –40 degrees to +100 degrees C. The LEDs shall be moisture resistant epoxy with UV-A and UV-B inhibitors.

Pixel power drawn from the DC supplies shall not exceed 1.5 watts per pixel, including the driving circuitry. A minimum of three photocells shall be installed on the sign. These devices shall permit automatic light intensity measurement of light conditions at each sign location. These photocells shall be mounted in a manner to measure front, rear and ambient light conditions.

Provisions shall be made to prevent perceivable brightening of the sign due to stray headlights shining upon the photo sensors at night.

The power supplies shall be paralleled in a diode or a configuration such that one supply may completely fail and the sign will still be supplied with enough power to run 40 percent of all pixels.

All cables shall be securely clamped or tied in the sign housing. No adhesive attachments will be allowed.

The signs shall be capable of displaying ASCII characters 32 through 126 (including all upper and lower case letters and digits from 0 to 9) at any location in a message line.

(e) *Communication*

The sign controller shall be capable of being controlled from the central system control software and the controller interface cabinet via RS-232 serial and Ethernet communications.

The sign controller shall include separate interfaces for communication with the central system control software and the controller interface cabinet.

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The communications between the sign controller and the central system control software and controller interface cabinet shall comply with the NEMA National Transportation Communications for ITS Protocol (NTCIP). The sign controller shall support all NTCIP conformance levels, conformance groups, objects, and minimum storage sizes and ranges as specified in the NTCIP Section within this specification.

In addition to the standard Management Information Base (MIB) objects, the sign shall include any additional manufacturer-specific MIB objects required to support all of the sign and central software functionality defined in this specification and in the NTCIP Section within this specification..

Dial-up or hardwire multi-drop communication lines shall be protected by two stages of transient voltage suppression devices including MOVS and spark gap arrestor.

Protect low voltage communication lines (twisted pair or coaxial) with multi-stage one- pair or two-pair surge suppressors designed for high-exposure applications, providing common mode and differential mode protection, with a maximum clamping voltage of 10 volts greater than peak DC or maximum AC root mean square (RMS) signal voltage and peak surge current rating of 10 kiloamperes.

The sign controller shall be capable of being remotely reset from the central system control software.

The sign shall provide a minimum of 4 input and 4 output contact closures able to receive digital and or analog signals that will allow up to 15 message activations upon contact closure events. These message activations shall permit standard NTCIP operations to occur and also permit contact closure messages to occur without message activation collisions and or message activation errors. Contact closures shall be remotely accessible using standard NTCIP MIB objects. Contact closures shall be capable of issuing NTCIP traps.

The sign controller shall allow user-configuration of maximum and minimum temperature in which to turn fans on and off.

The sign shall have polling capability and at a minimum shall be capable of reporting the status of the following:

(1) Pixel operational status that includes every string of every pixel
(2) Sign and ambient temperature
(3) DC power supply status
(4) The current state (on or off) of each pixel, including any pixel errors, in the actual, currently displayed message without disturbing the message in any way. This shall be real time and shall not be based on a previous pixel test.
(5) Cooling fan status
(6) Access door alarm
(7) Communication failure log
(8) UPS status
(9) AC surge protector status

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The controller software shall be capable of displaying the following types of messages:

(1) Static messages capable of displaying any character or set of characters
(2) Full graphic capabilities.
(3) Flashing messages with the following ranges of adjustable timing:
  A) Message time on from 0.5 to 5.0 seconds in 0.1 second increments.
  B) Message time off from 0.5 to 5.0 seconds in 0.1 second increments.
(4) Alternating messages capable with the following ranges of adjustable timing:
  A) Primary message time on from 0.5 to 5.0 seconds in 0.1 second increments.
  B) Primary message time off from 0 to 5.0 seconds in 0.1 second increments.
  C) Alternate message time on from 0.5 to 5.0 seconds in 0.1 second increments.
  D) Alternate message time off from 0 to 5.0 seconds in 0.1 second increments.

It shall be possible to flash any character or set of characters in an alternating message at the adjustable frequencies listed above for flashing messages. The flashing period shall be a sub-multiple of the associated alternating on time. It shall also be possible to flash any character or set of characters in a static message.

The sign controller shall monitor the photo cell circuits in the sign and convert the measured light intensity into the desired pixel brightness.

(f) *Uninterruptable Power Supply (UPS)*

The UPS system shall provide “On-Line” dual conversion control.

The UPS shall be rated per the following:

(1) Input Voltage: 85 VAC to 135 VAC
(2) Input Frequency: 48 to 62 Hz
(3) Output Voltage: 120 VAC plus or minus 3 percent
(4) Output Frequency: 60 Hz
(5) Power: VA required to run; DMS sign control electronics, communication equipment, and half of the pixels in the face with all LED illuminated at day time brightness levels allowing the sign functionality during a power outage for a minimum of 8 hours.

The unit shall be designed for a hot swap of components and shall not compromise existing DMS wiring. The unit shall provide for RS232 communication and contact closures for alarm functions. The unit shall be temperature rated to operate from 0 degree C to +40 degree C.

The UPS system shall be capable of producing simultaneously-fully regenerated, conditioned power with true sine wave and continuous AC outputs with stand by capability.

The unit shall have a re-settable power event counter to record the number of power utility failures, a battery run-time counter and temperature compensated battery charging.

The UPS System shall be capable of providing continuous, fully conditioned (both voltage and frequency), regulated, sinusoidal AC power to selected devices such as controllers, modems, 5 volt power supplies, and sign face drivers.

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Wiring shall comply with national electrical code (NEC) standards and approved wiring methods. Properly rated SO/SJO cords shall be allowed to allow easy replacement of the UPS System.

The UPS shall be 19-inch rack mountable and shall be accompanied with 19-inch rack mountable aluminum battery shelves for installation in the DMS.

The UPS shall consist of two major components, the electronics module and the battery system.

(1) The electronics module shall consist of the following:
- A) True Sine wave, high frequency inverter.
- B) Minimum 3-stage, temperature compensated, battery charger
- C) For connection from the electronics module to the battery system, a dedicated harness shall be provided with quick-release, keyed, circular connectors, and braided nylon sleeving over all conductors.
- D) Local and remote control of UPS functions
- E) Local and remote communications capabilities

(2) The Battery System shall consist of the following:
- A) Shall run sign electronics, communication equipment, and half of the pixels in the face with all LED illuminated at day time brightness levels, for a minimum of 8 hours
- B) The batteries shall be comprised of extreme temperature, deep cycle Absorbed Glass Mat/Valve Regulated Lead Acid (AGM/VRLA) batteries that have been field proven and tested by the U.S. military.
- C) Batteries shall be certified to operate at extreme temperatures from -40’C to +74’C.
- D) The batteries shall be provided with appropriate interconnect wiring and a corrosion-resistant mounting trays and/or brackets appropriate for the location into which they will be installed.
- E) The interconnect cable shall be protected with abrasion-resistant nylon sheathing.
- F) Battery construction shall include heavy-duty, inter-cell connections for low-impedance between cells and heavy-duty plates to withstand shock and vibration.

The UPS System shall come standard with software, RS232 interface via a DB-9F connector (optional SNMP Adapter for TCP/IP protocols) allowing full, interactive, remote computer monitoring and control of the UPS functions. The software shall allow the user to set up all operational parameters either locally or remotely and test the functionality of the unit.

The UPS Alarm Function Monitoring shall come standard with a DB-9F connector with open collectors (40 V @ 20 mA) indicating:

(1) Loss of utility power
(2) Inverter failure
(3) Low battery

The UPS Front Panel Controls shall come standard with Power ON, Cold (DC) Start, Alarm Silence, Battery Test, Bypass Breaker and DC/Battery Breaker.

Reliability shall be calculated with mean time between failures (MTBF) of 100,000 hours based on component ratings.

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(g) *Manufacturer Qualifications*

The manufacturer shall supply experience documentation showing that the manufacturer has been in business, under the current corporate name, designing and manufacturing Interstate LED Dynamic Message Signs for a minimum of five years; and that the manufacturer has in operation a minimum of 100 walk-in LED DMSs. These 100 DMS shall be from five separate projects and operational for a minimum of five years.

CONSTRUCTION REQUIREMENTS

Contractor shall be fully responsible for the delivery of the sign to the installation site and any damages that occur in the installation delivery process.

The DMS (Amber) shall be installed in accordance with manufacturer's recommendations. The Contractor's installation technician shall have a minimum certification from the DMS manufacturer. A qualified factory representative shall be available on site to ensure proper installation and testing.

The Contractor shall be responsible for locating the nearest electrical power and telephone sources and connecting those sources to the appropriate terminations with the DMS (Amber). The Contractor shall cooperate with the local electrical and telephone utilities to establish service accounts.

The Contractor shall perform a DMS acceptance test procedure for approval and acceptance by the Department in the presence of the Engineer, a representative of the CDOT Colorado Transportation Management Center, and the manufacturer's representative. The test shall include all items addressed in these specifications and any other requirements from the project plans or Engineer. The test shall also include the use of the latest version of the NTCIP Exerciser, or equivalent, to demonstrate that no proprietary protocols have been used and that the local and central software are NTCIP compliant.

The CDOT Form 1411 and written notification of the acceptance test date shall be submitted to the ITS group in Golden, CO 2 weeks prior to the acceptance test. Power and communications are required in order to schedule the acceptance.

A minimum of 5 copies of the operations manual detailing the electrical schematics, operation and maintenance of the DMS system, including spare software copies, shall be provided. Additional copies may be requested by the CDOT. One copy of the manual shall remain inside the sign housing or control cabinet. One copy shall be mailed to the Colorado Transportation Management Center at 425 C Corporate Circle, Golden, Colorado 80401.

The CTMS integrator shall be responsible for developing any graphics for the DMS and will provide to the Contractor or sign manufacturer. The Contractor or sign manufacturer shall request the graphics from the CTMS integrator 30 Calendar Days in advance and shall pre-load all graphics onto the signs.

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NTCIP SECTION

(a) *NTCIP Requirements*

This portion of the specification defines the detailed NTCIP requirements for the Dynamic Message Signs covered by the project specifications.

This specification references several standards through their NTCIP designated names. The following list provides the full reference to the current version of each of these standards. In many cases, the standard is more widely known by its original NEMA assigned number, in these cases, the NEMA number is also identified. The content of the NEMA standard is identical to that of the NTCIP standard.

Each NTCIP Component covered by these project specifications shall implement the most recent version of the standard that is at the stage of Recommended or higher as of January, 01, 2011, including any and all Approved or Recommended

Amendments to these standards as of the same date. It is the ultimate responsibility of the vendor to monitor NTCIP activities to discover any more recent documents.

(b) *General Requirements:*

1. **Subnet Level.** NTCIP Components may support additional Subnet Profiles at the vendor's option. At any one time, only one Subnet Profiles shall be active on a given serial port of the NTCIP Component. If the NTCIP Component has a serial port that supports multiple Subnet Profiles, the NTCIP Component shall be configurable to allow the field technician to activate the desired Subnet Profile and shall provide a visual indication of the currently selected Subnet Profile.

2. **Transport Level.** Each NTCIP Component shall comply with NTCIP 2202, (NEMA TS 3.Internet). NTCIP Components may support additional Transport Profiles at the manufacturer's option. Response datagrams shall use the same Transport Profile used in the request. Each NTCIP Component shall support the receipt of datagrams conforming to any of the identified Transport Profiles at any time.

3. **Application Level.** Each DMS (Amber) shall comply with NTCIP 2301, (NEMA TS 3.AP-STMF), as a Managed Agent and shall meet the requirements for Conformance Level 1 (NOTE – See Amendment to standard). Simple network management protocol (SNMP) shall be required and simple transportation management protocol (STMP) shall not be required. An NTCIP Component may support additional Application Profiles at the manufacturer's option. Responses shall use the same Application Profile used by the request. Each NTCIP Component shall support the receipt of Application data packets at any time allowed by the subject standards.

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4. **Information Level.** Each NTCIP Component shall provide Full, Standardized Object Range Support of all objects required by these procurement specifications, unless otherwise indicated below. The maximum Response Time for any object or group of objects shall be 200 milliseconds.

The vendor's software shall implement all mandatory objects of the mandatory conformance group defined in NTCIP 1201, (NEMA TS 3.4) Global Object Definitions:

(1) Configuration Conformance Group – Section 3.1
(2) Security Conformance Group (new in Amendment 1)

The vendor's software shall implement the mandatory objects of the optional conformance groups defined in NTCIP 1201, (NEMA TS 3.4), Global Object Definitions:

(1) Time Management Conformance Group – Section 3.3
(2) TimeBase Event Schedule Conformance Group – Section 3.4
(3) Report Conformance Group – Section 3.5

The vendor's software shall implement all mandatory objects of all mandatory conformance groups defined in NTCIP 1203, (NEMA TS 3.6) Object Definitions for Dynamic Message Signs (DMS):

(1) Sign Configuration Conformance Group – Section 4.1
(2) Message Table Conformance Group – Section 4.6
(3) Sign Control Conformance Group – Section 4.7

The vendor's software shall implement all mandatory objects of the optional conformance groups defined in NTCIP 1203, (NEMA TS 3.6), Object Definitions for Dynamic Message Signs (DMS):

(1) GUI Appearance – Section 4.2
(2) Font Definition – Section 4.3
(3) DMS Sign Configuration – Section 4.4
(4) MULTI Configuration – Section 4.5
(5) Default Message – Section 4.8
(6) MULTI Error – Section 4.10
(7) Illumination/Brightness – Section 4.11
(8) Scheduling – Section 4.12
(9) Auxiliary I/O – Section 4.13
(10) Sign Status – Section 4.14
(11) Status Error – Section 4.15
(12) Pixel Error Status – Section 4.16
(13) Fan Error Status – Section 4.18
(14) Temperature Status – Section 4.17

The vendor's software shall implement the following optional objects defined in NTCIP 1203, (NEMA TS 3.6):

(1) dmsMessageBeacon – Section 2.6.1.1.1.8.6

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(2) dmsSWReset – Section 2.7.1.1.1.1
(3) dmsMessageTimeRemaining – Section 2.7.1.1.1.4
(4) dmsShortPowerRecoveryMessage – Section 2.7.1.1.1.8
(5) dmsLongPowerRecoveryMessage – Section 2.7.1.1.1.9
(6) dmsShortPowerLossTime – Section 2.7.1.1.1.10
(7) dmsResetMessage – Section 2.7.1.1.1.11
(8) dmsCommunicationsLossMessage – Section 2.7.1.1.1.12
(9) dmsTimeCommLoss – Section 2.7.1.1.1.13
(10) dmsPowerLossMessage – Section 2.7.1.1.1.14
(11) dmsEndDurationMessage – Section 2.7.1.1.1.15
(12) dmsMultiOtherErrorDescription – Section 2.7.1.1.1.20
(13) dmsStatDoorOpen – Section 2.11.1.1.1.6
(14) fanFailures – Section 2.11.2.1.1.8
(15) fanTestActivation – Section 2.11.2.1.1.9
(16) tempMinCtrlCabinet – Section 2.11.4.1.1.1
(17) tempMaxCtrlCabinet – Section 2.11.4.1.1.2
(18) tempMinAmbient – Section 2.11.4.1.1.3
(19) tempMaxAmbient – Section 2.11.4.1.1.4
(20) tempMinSignHousing – Section 2.11.4.1.1.5
(21) tempMaxSignHousing – Section 2.11.4.1.1.6

The vendor's software shall implement the following tags (opening and closing where defined) of MULTI as defined in NTCIP 1203, (NEMA TS 3.6), Object Definitions for Dynamic Message Signs (DMS):

MULTI Tag	Description
1	Field
2	Flash
3	Font
4	Hexadecimal Character
5	Justification Line
6	Justification Page
7	Moving Text
8	New Line
9	New Page
10	Page Time
11	Spacing – Character

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The Field Tag shall support the following field ID's:

Field Tag	Tag ID	Description
1	1	Time, 12-hour format (no AM/PM indicator)
2	2	Time, 24-hour format
3	3	Temperature in degrees Celsius
4	4	Temperature in degrees Fahrenheit
5	7	Day of week
6	8	Day of month
7	9	Month of year
8	10	Year, 2-digits
9	11	Year, 4-digits

5. **Sizes and Ranges.** All objects required by these procurement specifications shall support all values within its standardized range. The standardized range is defined by a size, range, or enumerated listing indicated in the object's SYNTAX field and/or through descriptive text in the object's DESCRIPTION field of the relevant standard. The following provides the current listing of known variances for this project:

Object	Reference	Minimum Project Requirements
NTCIP 1201 (TS 3.4)		
moduleTableEntry	2.2.3	Shall contain at least one row with moduleType equal to 3 (software). The moduleMake shall specify the name of the manufacturer; the moduleModel shall specify the manufacturer's name of the component and the modelVersion shall indicate the model version number of the component.
communityNamesMax	2.8.2	Shall be at least 4.
maxTimeBaseScheduleEntries	2.4.3.1	7
maxDayPlans	2.4.4.1	7
maxDayPlanEvents	2.4.4.2	7
maxEventLogConfigs	2.5.1	50
eventConfigMode	2.5.2.3	2,3,and 4
maxEventLogSize	2.5.3	200
maxEventClasses	2.5.5	7
maxGroupAddress	2.7.1	1
NTCIP 1203 v0305j (TS 3.6)		
dmsNumPermanentMsg	5.6.1	100
dmsMaxChangeableMsg	5.6.3	100
dmsFreeChangeableMemory	5.6.4	500 MB
dmsMaxVolatileMsg	5.6.6	100
dmsFreeVolatileMemory	5.6.7	500 MB
dmsMessageMultiString	5.6.8.3	See attached table

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REVISION OF SECTION 614
DYNAMIC MESSAGE SIGN (AMBER)

Object	Reference	Minimum Project Requirements
dmsControlMode	5.7.1	2,4,5
numFonts	5.4.1	10
maxFontCharacters	5.4.3	127
vmsCharacterHeightPixels	5.3.1	0
vmsCharacterWidthPixels	5.3.2	0
vmsSignHeightPixels	5.3.3	27
vmsSignWidthPixels	5.3.4	70
vmsHorizontalPitch	5.3.5	66-70 mm
vmsVerticalPitch	5.3.6	66-70 mm
defaultBackgroundColor	5.5.1	0 (black)
defaultJustificationLine	5.5.9	2,3,4
defaultJustificationPage	5.5.11	2,3,4
defaultFlashOn	5.5.3	0.5 to 5.0
defaultFlashOff	5.5.5	0.5 to 5.0
defaultPageOnTime	5.5.13	0.5 to 5.0
defaultPageOffTime	5.5.15	0.5 to 5.0
defaultCharacterSet	5.5.21	eightBit (2)
dmsMaxNumberPages	5.5.24	6
dmsColorScheme	5.5.22	1 (monochrome1bit)
dmsSupportedMultiTags	5.5.23	See Section 614 more Multi Tags details.

6. **Documentation.** The Software shall be supplied with full documentation and a CD-Rom containing ASCII versions of the following Management Information Base (MIB) files in Abstract Syntax Notation 1 (ASN.1) format:

   (1) Relevant version of each official standard MIB Module referenced by the device functionality.
   (2) If the device does not support the full range of any given object within a Standard MIB Module, a vendor specific version of the official Standard MIB Module with the supported range indicated in ASN.1 format in the SYNTAX and/or DESCRIPTION fields of the associated OBJECT TYPE macro. The filename of this file shall be identical to the standard MIB Module, except that it will have the extension ".man".
   (3) A MIB Module in ASN.1 format containing any and all manufacturer-specific objects supported by the device with accurate and meaningful DESCRIPTION fields and supported ranges indicated in the SYNTAX field of the OBJECT-TYPE macros.
   (4) A MIB containing any other objects supported by the device.

   The vendor shall allow the use of any and all of this documentation by any party authorized by CDOT for systems integration purposes at any time initially or in the future, regardless of what parties are involved in the systems integration effort.

REVISION OF SECTION 614
LANE USE SIGN AND
SIDEMOUNT VARIABLE MESSAGE SIGN

Section 614 of the Standard Specifications is hereby revised for this Project to include the following:

DESCRIPTION

This work consists of furnishing, installing and testing full-color, full matrix Light Emitting Diode (LED) Lane Use Signs (LUS), sidemount variable message signs (SMVMS), associated equipment controller and cabinets, cabinet foundation and mounting hardware.

The LUS shall have a 64 x 64 pixel matrix with a 20 mm pixel pitch and shall utilize 24 bit RGB color. The LUS shall be 60 inches wide by 60 inches tall with an allowable variation of plus or minus 3 inches. The depth of the LUS shall not exceed 15 inches and the weight shall not exceed 420 pounds.

The SMVMS shall have a 80 x 80 pixel matrix at 20 mm pixel pitch and shall utilize 24 bit RGB color. The depth of the SMVMS shall not exceed 15 inches and the weight shall not exceed 500 pounds.

The sign controller(s) for the LUS and SMVMS shall be capable of controlling and monitoring multiple signs. The signs and sign controllers shall be capable of operating without any decrease in performance over a temperature range of -34° F to +140° F and a relative humidity range of 0 to 99 percent, non-condensing.

MATERIALS

(a) *Certifications:* Prior to start of the installation of the LUS and SMVMS the Contractor shall provide the following certifications to the Engineer for Approval:

1. Certification showing that the manufacturer is fully compliant with ISO 9001 prior to the start of construction of this Project. The ISO 9001 Certification shall apply to the facility, and to the design, fabrication, installation, and maintenance of the signs. The facility where this company actually designs and manufactures the signs shall be ISO 9001:2000 or later certified a minimum of one year prior to the start of construction.

2. Working drawings showing the sign housing and mounting brackets shall be sealed by a Professional Engineer (PE) registered in the State of Colorado and shall be submitted in accordance with subsection 105.02. The sign housing shall also be designed and PE sealed to comply with applicable requirements of current American Association of State Highway and Transportation Officials (AASHTO) Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals.

3. Certification showing that welding of the sign housing is in accordance with the American Welding Society (AWS) Standards, ANSI/AWS D1.2-97. The manufacturer's welders and welding procedures shall be certified by an ANSI/AWS Certified Welding Inspector to the ANSI/AWS D1.2-97 Structural Welding Code for Aluminum.

4. Certification that all aluminum face materials have a coating that meets or exceeds the requirements of the American Architectural Manufacturers Association (AAMA) Specifications Publication No. 2605. (16) Certification that the LEDs were tested and binned in accordance with the CIE Standard Condition A. Documentation and information on software as described in NTCIP Requirements of this Project Special Provision.

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REVISION OF SECTION 614
LANE USE SIGN AND
SIDEMOUNT VARIABLE MESSAGE SIGN

5. Documentation verifying the LUS and SMVMS is listed by an accredited 3rd party testing organization for conformance to UL48 and UL 1433.

6. Documentation providing proof printed circuit board (PCB) conformal coating conformance to IPC-CC-830. (19) Documentation that the sign's structural integrity is in conformance to current AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals.

7. Documentation that the LUS and SMVMS conforms to the Transient Protection and Vibration of the NEMA Standard TS4, Section2.

(b) *Sign Housing:* All component parts shall be easily and readily accessible by a single person for inspection and maintenance. The housing shall be weather tight, and compliant to the National Electrical Manufacturers Association (NEMA) 3R Standard. All parts shall be made of corrosion resistant materials, such as plastic, stainless steel or aluminum. Painted steel is not acceptable. No self-tapping screws shall be used. The exterior front face surfaces shall be finish coated by a system that meets or exceeds the AAMA Specification No. 2605. The finish shall be matte black.

The main body of the sign housing shall be constructed of aluminum with a natural mill finish. All exterior seams shall be continuously welded by an inert gas process, except for the coated fascia material.

The glazing shall be constructed of clear polycarbonate sheets with surfaces that resist hazing from UV light. The glazing shall be protected by an aluminum mask with apertures punched directly in front of each pixel. The coating shall meet or exceed the AAMA Specification No. 2605.

For surge protection, the system power shall be protected by two stages of transient voltage suppression devices. Tripping of each stage (or both if tripped simultaneously) of the surge protection shall cause the sign controller to report the error condition to central on the next poll (for multi-drop operation). There shall be an option that is either enabled or disabled and is selected and downloaded from the central system control software to the sign controller. When this option is enabled, tripping of the second stage of surge protection shall prevent power from reaching any components of the sign until the surge protection has been replaced. When this option is disabled, the sign will continue to function normally after the second stage of surge protection is tripped.

(c) *Sign Mounting Bracket Assembly:* The mounting brackets for LUS and SMVMS shall be designed in accordance to standard sign mounting bracket for monotube structures.

(d) *Electronics:* All electronic components, except printed circuit boards, shall be commercially available, easily accessible, replaceable and individually removable using conventional electronics repair methods.

All PCBs shall be completely conformal coated in accordance to IPC CC-830 standard. The exception for this coating shall be the pixels on the front of the PCB of the LED motherboards and any components in sockets.

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REVISION OF SECTION 614
LANE USE SIGN AND
SIDEMOUNT VARIABLE MESSAGE SIGN

All integrated circuits shall be individually replaceable. Components shall be arranged so they are easily accessible for testing and replacement. All circuit designs shall utilize high quality electronic components and shall provide a mean time before failure of at least 3 years. Provisions shall be made to prevent face fogging and condensation.

The sign shall be capable of operating with 120/240 VAC, 60 Hz, single phase power.

Pixels shall be constructed with discrete LEDs manufactured by a reputable manufacturer such as Avago Technologies (formerly Agilent Technologies), Nichia Corporation, OSRAM or EOI. Discrete LEDs shall conform to the following specifications:

(1) All LEDs shall have a nominal viewing cone of 30 degree angle of 15 degrees measured from the center of the longitudinal viewing cone.

(2) Color LEDs shall utilize AlInGaP semiconductor technology and shall emit light that has a peak wavelength of 590 ± 5 nm. Color LEDs shall utilize Red AlInGaP 626 nm, Green InGaN 525 nm and Blue InGaN 470 nm.

(3) The LED packages shall be fabricated from UV light resistant epoxy.

(4) The LED manufacturer shall perform intensity sorting of the bins. LEDs shall be obtained from no more than two consecutive luminous intensity “bins” as defined by the LED manufacturer.

(5) The LED manufacturer shall perform color sorting of the bins. LEDs shall be obtained from no more than two consecutive color “bins” as defined by the LED manufacturer.

(6) The various LED color and intensity bins shall be distributed evenly throughout the sign and shall be consistent from pixel to pixel. Random distribution of the LED bins shall not be accepted.

(7) The LED manufacturer shall assure color uniformity and consistency on the LED display face within the 30 degree cone of vision and shall not have inconsistent color and intensity shifts.

(8) LED package style shall be surface-mount or through-hole with or without standoffs.

(9) All LEDs used in all LUS and SMVMS provided for this contract shall be from the same manufacturer and of the same part number, except for the variations in the part number due to the intensity and color.

(10) The LEDs shall be rated by the LED manufacturer to have a minimum lifetime of 100,000 hours of continuous operation while maintaining a minimum of 70% of the original brightness.

Pixel power drawn from the DC supplies shall not exceed 1.5 watts per pixel, including the driving circuitry. The signs shall be equipped with a minimum of two photo sensors that measure

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REVISION OF SECTION 614
LANE USE SIGN AND
SIDEMOUNT VARIABLE MESSAGE SIGN

outdoor ambient light level. These devices shall permit automatic light intensity measurement of light conditions at each sign location. These sensors shall be mounted in a manner to measure front, rear and ambient light conditions. Provisions shall be made to prevent perceivable brightening of the sign due to stray headlights shining upon the photo sensors at night.

The power supplies shall be paralleled in a diode OR configuration such that one supply may completely fail and the sign will still be supplied with enough power to run 40% of all pixels.

The signs shall be capable of displaying ASCII characters 32 through 126 (including all upper and lower case letters and digits from 0 to 9) at any location in a message line.

(e) *Cabinet:* The cabinet shall be NEMA 3R ground mount traffic controller style cabinet with dual-sided access, polycarbonate base and cast-in-place concrete pad. The cabinet type shall be as follows:

The cabinet shall be a Model 332 cabinet or larger if required to house all required components. The Contractor shall be responsible for the design of the cabinet.

The equipment cabinet shall be natural aluminum with anchor bolts in accordance with the FHWA-IP-78-16 specification. The cabinet shall include the following minimum requirements:

(1) Two internal (front/back) fluorescent lamps

(2) Full-height standard Electronics Industry Alliance (EIA) 19-inch rack with a minimum of one pullout drawer

(3) Power panel board circuit breakers meeting the following minimum requirements

(4) Service entrance-rated

(5) Minimum of 12 circuit breaker mounting positions

(6) Short circuit rating of 22,000 amps for main and 10,000 amps branch circuits

(7) Underwriters' Laboratories (UL) Listed

(8) Two 15-amp NEMA 15-R 120VAC duplex outlet with one ground-fault circuit interrupter.

(9) One earth ground lug that is electrically bonded to the cabinet.

(10) One thermostatically controlled 100 cubic feet per minute (cfm) exhaust fan mounted near the top of the cabinet.

(11) Filtered air intake ports with removable and replaceable fan and filter located on the bottom third of each access door.

(12) Remote communication device.

A 19-inch rack mountable power conditioner shall be installed in the DMS equipment cabinet to provide – simultaneously- fully regenerated, conditioned power with true sine wave and continuous AC outputs to controllers, and communication devices.

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The system power and communication lines shall each be protected by two stages of surge protection devices. The first stage shall be an arc discharge, gas discharge tube or a thyristor surge protection based unit with local and remote reporting capability. The second stage shall be metal oxide varistor (MOV) based. This second stage shall include a crowbar circuit, that when remotely enabled, shall trip the power circuit breaker when the second stage surge suppressor is activated. In both cases, tripping of each stage (or both if tripped simultaneously) of the surge protection and shall report the power surge condition to the sign controller for report to central. The crowbar shall be an option that is either enabled or disabled and is selected and downloaded from the central system control software to the sign controller. When this option is enabled, tripping of the second stage of surge protection shall prevent power from reaching any components of the sign until the surge protection has been replaced. When this option is disabled, the sign will continue to function normally after the second stage of surge protection is tripped.

(f) *Control and Communication:* The sign controller shall be supplied by the manufacturer of the LUS and SMVMS. The sign controller shall be a stand-alone microprocessor-based system, which does not require continuous communication with central control software in order to perform most sign control functions. A single sign controller shall be capable of controlling a minimum of five signs. LUS and SMVMS can be controlled by separate controllers.

The sign controller shall meet the following operational requirements:

(1) Communicate using embedded National Transportations Communication for Intelligent Transportation System Protocol (NTCIP) protocol

(2) Contain memory for storing changeable and permanent messages, schedules, and other necessary files for controller operation

(3) Include a front panel user interface with graphical vacuum fluorescent display (VFD) or LCD and keypad for direct operation and diagnostics

(4) Contain a minimum of one NTCIP-compliant Ethernet port with RJ45 connector

(5) Have the ability to play volatile messages

(6) Contain sign-specific control firmware (embedded software) that shall monitor all external and internal sensors and communication inputs and control the display modules as directed by external control software and the front panel interface

NTCIP shall be natively supported in the sign controller. External protocol converter or translator devices shall not be allowed. The sign controller shall be programmed to receive and transmit NTCIP compliant sign control commands from the central system control software and laptop computer. The controller shall have power-up and auto-restart capabilities with programmable default actions when recovering from a power off condition. A hardware watch dog circuit shall provide automatic reset of the controller and communications device. Central control shall have ability to perform a remote command for the controller and communications device reset.

The controller shall be able to accept standard uninterruptible power supply (UPS) shutdown commands via Ethernet or serial interface.

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The controller shall perform all communication, control and feedback functions and shall not require an intermediate control device and be the only sign controller. Communication and control lines between the sign controller and the system interface circuits shall be opto-coupled.

The sign controller shall be capable of being controlled from the central system control software via RS-232 serial and Ethernet communications.

The communications between the sign controller and the central system control software shall comply with the NTCIP. The sign controller shall support all NTCIP conformance levels, conformance groups, objects, and minimum storage sizes and ranges as specified in NTCIP Requirements in this specification.

In addition to the standard Management Information Base (MIB) objects, the sign shall include any additional manufacturer-specific MIB objects required to support all of the sign and central software functionality defined in this specification.

Protect low voltage communication lines (twisted pair or coaxial) with multi-stage one- pair or two-pair surge suppressors designed for high-exposure applications, providing common mode and differential mode protection, with a maximum clamping voltage of 10 volts greater than peak DC or maximum AC RMS signal voltage and peak surge current rating of 10kA.

The sign controller shall be capable of being remotely reset from the central system control software.

The sign controller shall provide software modules that will allow integration with CDOT Colorado Transportation Management System (CTMS).

The sign controller shall allow user-configuration of maximum and minimum temperature in which to turn fans on and off.

The sign controller shall have polling capability and at a minimum shall be capable of reporting the status of the following:

(1) Pixel operational status that includes every string of every pixel

(2) Sign and ambient temperature

(3) DC power supply status

(4) The current state (on or off) of each pixel, including any pixel errors, in the actual, currently displayed message without disturbing the message in any way. This shall be real time and shall not be based on a previous pixel test.

(5) Communication failure log

(6) AC surge protector status

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The controller software shall be capable of displaying the following types of messages:

1. Static or alternating messages capable of displaying any character or set of characters

2. Full graphic capabilities.

The sign controller shall be capable of monitoring ambient light sensor circuits in the sign and convert the measured light intensity into the desired pixel brightness.

MANUFACTURER QUALIFICATIONS

The manufacturer shall supply experience documentation showing that the manufacturer has been in business, under the current corporate name, designing and manufacturing LUS and SMVMS for a minimum of five years prior to the start of construction; and that the manufacturer has in operation a minimum of 100 LUS and SMVMS. These 100 signs shall be from a minimum of 5 separate projects and operational for a minimum period of 3 years prior to the start of construction.

TRAINING

The manufacturer shall provide 8 hours of class room training for CDOT at the CTMC in Golden, Colorado in addition to 8 hours of on-site training at the signs.

CONSTRUCTION REQUIREMENTS

Contractor shall be fully responsible for the delivery of the signs, sign controllers, cabinets and cabinet bases to the installation site and any damages that occur in the installation delivery process. Construction of concrete pad and installation of controller cabinet base shall be done in accordance to CDOT M & S standards.

Contractor shall provide a minimum of 10 feet of coiled slack power and control cables for each LUS or SMVMS in the pull boxes or inside the sign structure.

The signs and controllers shall be installed in accordance with manufacturer's recommendations. A qualified factory representative shall be available on site to ensure proper installation and testing.

See Testing & Integration Plan for additional requirements.

Installation of all earth grounding shall conform to the current National Electric Code.

A minimum of 5 copies of the operations manual detailing the electrical schematics, operation and maintenance of the LUS and SMVMS system, including spare software copies, shall be provided to the Department. Additional copies may be requested by the Department. One of the 5 copies of the manual shall remain inside the equipment cabinet. Four remaining copies shall be delivered to the Colorado Transportation Management Center at 425 C Corporate Circle, Golden, Colorado 80401.

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The CTMS integrator shall be responsible for developing any graphics for the LUS and SMVMS and will provide to the Contractor or sign manufacturer. The Contractor or sign manufacturer shall request the graphics from the CTMS integrator 30 Calendar Days in advance and shall pre-load all graphics onto the signs.

The LUS and SMVMS shall include installation, testing, acceptance, labor, materials, and equipment necessary to complete the work of installation and operations. Work includes delivery of all equipment and cabinets to the installation site; installation of sign controllers, auxiliary control panel, sign housing, and all associated electronics, communications equipment, equipment cabinet, and wiring; all tests as described herein; and standard warranty. Work includes ensuring there are communications between sign devices and CTMC.

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All costs associated with the delivery of the sign to the installation site will not be measured and paid for separately, but shall be included in the work.

NTCIP SECTION

NTCIP Requirements:
This portion of the specification defines the detailed NTCIP requirements for the LUS and SMVMS covered by the project specifications. This specification references several standards through their NTCIP designated names. The following list provides the full reference to the current version of each of these standards. In many cases, the standard is more widely known by its original NEMA assigned number, in these cases, the NEMA number is also identified. The content of the NEMA standard is identical to that of the NTCIP standard.

Each NTCIP Component covered by these Project Specifications shall implement the most recent version of the standard that is at the stage of Recommended or higher, including any and all Approved or Recommended Amendments to these standards as of the same date. It is the ultimate responsibility of the Contractor to monitor NTCIP activities to discover any more recent documents.

General Requirements:

Subnet Level
NTCIP Components may support additional Subnet Profiles at the vendor's option. At any one time, only one Subnet Profiles shall be active on a given serial port of the NTCIP Component. If the NTCIP Component has a serial port that supports multiple Subnet Profiles, the NTCIP Component shall be configurable to allow the field technician to activate the desired Subnet Profile and shall provide a visual indication of the currently selected Subnet Profile.

Transport Level
Each NTCIP Component shall comply with NTCIP 2202, (NEMA TS 3.Internet). NTCIP Components may support additional Transport Profiles at the manufacturer's option. Response datagrams shall use the same Transport Profile used in the request. Each NTCIP Component shall support the receipt of datagrams conforming to any of the identified Transport Profiles at any time.

Application Level
Each LED DMS shall comply with NTCIP 2301, (NEMA TS 3.AP-STMF), as a Managed Agent and shall meet the requirements for Conformance Level 1 (NOTE—See Amendment to standard). Simple network management protocol (SNMP) shall be required and simple transportation management protocol (STMP) shall not be required. An NTCIP Component may support additional Application Profiles at the manufacturer's option. Responses shall use the same Application Profile used by the request. Each NTCIP Component shall support the receipt of Application data packets at any time allowed by the subject standards.

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Information Level

Each NTCIP Component shall provide Full, Standardized Object Range Support of all objects required by these procurement specifications, unless otherwise indicated below. The maximum Response Time for any object or group of objects shall be 200 milliseconds.

The vendor's software shall implement all mandatory objects of the mandatory conformance group defined in NTCIP 1201, (NEMA TS 3.4) Global Object Definitions:

- Configuration Conformance Group—Section 3.1
- Security Conformance Group (new in Amendment 1)

The vendor's software shall implement the mandatory objects of the optional conformance groups defined in NTCIP 1201, (NEMA TS 3.4), Global Object Definitions:

- Time Management Conformance Group—Section 3.3
- TimeBase Event Schedule Conformance Group—Section 3.4
- Report Conformance Group—Section 3.5

The vendor's software shall implement all mandatory objects of all mandatory conformance groups defined in NTCIP 1203, (NEMA TS 3.6) Object Definitions for Variable Message Signs:

- Sign Configuration Conformance Group—Section 4.1
- Message Table Conformance Group—Section 4.6
- Sign Control Conformance Group—Section 4.7

The vendor's software shall implement all mandatory objects of the optional conformance groups defined in NTCIP 1203, (NEMA TS 3.6), Object Definitions for Variable Message Signs:

- GUI Appearance—Section 4.2
- Font Definition—Section 4.3
- VMS Sign Configuration—Section 4.4
- MULTI Configuration—Section 4.5
- Default Message—Section 4.8
- MULTI Error—Section 4.10
- Illumination/Brightness—Section 4.11
- Scheduling—Section 4.12
- Auxiliary I/O—Section 4.13
- Sign Status—Section 4.14
- Status Error—Section 4.15
- Pixel Error Status—Section 4.16
- Fan Error Status—Section 4.18
- Temperature Status—Section 4.17

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The vendor's software shall implement the following optional objects defined in NTCIP 1203, (NEMA TS 3.6):

- dmsMessageBeacon—Section 2.6.1.1.1.8.6
- dmsSWReset—Section 2.7.1.1.1.1
- dmsMessageTimeRemaining—Section 2.7.1.1.1.4
- dmsShortPowerRecoveryMessage—Section 2.7.1.1.1.8
- dmsLongPowerRecoveryMessage—Section 2.7.1.1.1.9
- dmsShortPowerLossTime—Section 2.7.1.1.1.10
- dmsResetMessage—Section 2.7.1.1.1.11
- dmsCommunicationsLossMessage—Section 2.7.1.1.1.12
- dmsTimeCommLoss—Section 2.7.1.1.1.13
- dmsPowerLossMessage—Section 2.7.1.1.1.14
- dmsEndDurationMessage—Section 2.7.1.1.1.15
- dmsMultiOtherErrorDescription—Section 2.7.1.1.1.20
- dmsStatDoorOpen—Section 2.11.1.1.1.6
- fanFailures—Section 2.11.2.1.1.8
- fanTestActivation—Section 2.11.2.1.1.9
- tempMinCtrlCabinet—Section 2.11.4.1.1.1
- tempMaxCtrlCabinet—Section 2.11.4.1.1.2
- tempMinAmbient—Section 2.11.4.1.1.3
- tempMaxAmbient—Section 2.11.4.1.1.4
- tempMinSignHousing—Section 2.11.4.1.1.5
- tempMaxSignHousing—Section 2.11.4.1.1.6

The vendor's software shall implement the following tags (opening and closing where defined) of MULTI as defined in NTCIP 1203, (NEMA TS 3.6), Object Definitions for Variable Message Signs:

MULTI Tag
1. Field
2. Flash
3. Font
4. Hexadecimal Character
5. Justification Line
6. Justification Page
7. Moving Text
8. New Line
9. New Page
10. Page Time
11. Spacing—Character

The Field Tag shall support the following field ID's:

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Field Tag ID Description

1	1	Time, 12-hour format (no AM/PM indicator)
2	2	Time, 24-hour format
3	3	Temperature in degrees Celsius
4	4	Temperature in degrees Fahrenheit
5	7	Day of week
6	8	Day of month
7	9	Month of year
8	10	Year, 2-digits
9	11	Year, 4-digits

Sizes and Ranges

All objects required by these procurement specifications shall support all values within its standardized range. The standardized range is defined by a size, range, or enumerated listing indicated in the object's SYNTAX field and/or through descriptive text in the object's DESCRIPTION field of the relevant standard. The following provides the current listing of known variances for this project:

NTCIP 1201 (TS 3.4)

Object	Reference	Minimum Project Requirements
moduleTableEntry	2.2.3	Shall contain at least one row with moduleType equal to 3 (software). The moduleMake shall specify the name of the manufacturer, the moduleModel shall specify the manufacturer's name of the component and the modelVersion shall indicate the model version number of the component.
communityNamesMax	2.8.2	Shall be at least 4
maxTimeBaseScheduleEntries	2.4.3.1	7
maxDayPlans	2.4.4.1	7
maxDayPlanEvents	2.4.4.2	7
maxEventLogConfigs	2.5.1	50
eventConfigMode	2.5.2.3	2,3,and 4
maxEventLogSize	2.5.3	200
maxEventClasses	2.5.5	7
maxGroupAddress	2.7.1	1

NTCIP 1203 (TS 3.6)

dmsNumPermanentMsg	2.6.1.1.1.1	50
dmsMaxChangeableMsg	2.6.1.1.1.3	50
dmsFreeChangeableMemory	2.6.1.1.1.4	50KB
dmsMaxVolatileMsg	2.6.1.1.1.6	50

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dmsFreeVolatileMemory	2.6.1.1.1.7	50KB
dmsMsgMultiString	2.6.1.1.1.8.3	See attached table
dmsControlMode	2.7.1.1.1.1	2,4,5
numFonts	2.4.1.1.1.1	4
maxFontCharacters	2.4.1.1.1.3	127
vmsCharacterHeightPixels	2.3.1.1.1.1	varies
vmsCharacterWidthPixels	2.3.1.1.1.2	varies
vmsSignHeightPixels	2.3.1.1.1.3	64 or 80
vmsSignWidthPixels	2.3.1.1.1.4	64 or 80
vmsHorizontalPitch	2.3.1.1.1.5	20mm
vmsVerticalPitch	2.3.1.1.1.6	20mm
defaultBackgroundColor	2.5.1.1.1.1	0 (black)
defaultForegroundColor	2.5.1.1.1.2	9 (amber)
defaultJustificationLine	2.5.1.1.1.6	2,3,4
defaultJustificationPage	2.5.1.1.1.7	2,3,4
defaultFlashOn	2.5.1.1.1.3	0.5 to 5.0
defaultFlashOff	2.5.1.1.1.4	0.5 to 5.0
defaultPageOnTime	2.5.1.1.1.8	0.5 to 5.0
defaultPageOffTime	2.5.1.1.1.9	0.5 to 5.0
defaultCharacterSet	2.5.1.1.1.10	eightBit (2)
numActionTableEntries	2.9.1.1.1.1	15

Documentation

Software shall be supplied with full, electronic documentation containing American Standard Code for Information Interchange (ASCII) versions of the following Management Information Base (MIB) files in Abstract Syntax Notation 1 (ASN.1) format:

- The relevant version of each official standard MIB Module referenced by the device functionality.
- If the device does not support the full range of any given object within a Standard MIB Module, a vendor specific version of the official Standard MIB Module with the
- supported range indicated in ASN.1 format in the SYNTAX and/or DESCRIPTION fields of the associated OBJECT TYPE macro. The filename of this file shall be identical to the standard MIB Module, except that it will have the extension ".man".
- A MIB Module in ASN.1 format containing any and all manufacturer-specific objects supported by the device with accurate and meaningful DESCRIPTION fields and supported ranges indicated in the SYNTAX field of the OBJECT-TYPE macros.
- An MIB containing any other objects supported by the device.

The vendor shall allow the use of any and all of this documentation by any party authorized by CDOT for systems integration purposes at any time initially or in the future, regardless of what parties are involved in the systems integration effort.

REVISION OF SECTION 614
VARIABLE TOLL MESSAGE SIGN (VTMS)

Section 614 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

This work consists of furnishing and installing a Light Emitting Diode Variable Toll Message Sign (LED VTMS) and associated equipment cabinets. The sign shall be fully compatible with the mounting hardware and support structure shown on the plans. The LED VTMS shall be equipped with the ability to display 7 characters of text at a height of 18-inch tall characters. The pixel pitch shall be 66-70 mm. The sign shall include a power shut off mounted to the sign structure near the controller interface cabinet. The sign shall be capable of operating without any decrease in performance over a temperature range of -34° F to +140° F with a relative humidity of 0 to 99 percent, non-condensing. The sign shall have a minimum design life of 20 years.

MATERIALS

(a) *Certifications.* Prior to start of the installation of the LED VTMS the Contractor shall provide the following certifications to CDOT for Approval:

1. Certification showing that the manufacturer of the LED VTMS is fully compliant with ISO 9001 prior to the start of construction for this Project. The ISO 9001 Certification shall apply to the facility, and to the design, fabrication, installation, and maintenance of the LED VTMS. The facility where this company actually designs and manufactures the LED VTMS shall be ISO 9001:2000 certified a minimum of one year prior to the start of construction.

2. Working drawings showing the sign housing shall be sealed by an Engineer registered in the State of Colorado and shall be submitted in accordance with subsection 105.02.

3. Certification showing that welding of the LED VTMS housing is in accordance with the American Welding Society (AWS) Standards, ANSI/AWS D1.2-97. The LED VTMS manufacturer's welders and welding procedures shall be certified by an ANSI/AWS Certified Welding Inspector to the ANSI/AWS D1.2-97 Structural Welding Code for Aluminum.

4. Certification that all aluminum face materials have a coating that meets or exceeds the requirements of the American Architectural Manufacturers Association (AAMA) Specifications Publication No. 2605.

5. Certification that the LEDs were tested and binned in accordance with the CIE Standard Condition A.

6. Documentation and information on software as described in National Transportation Communications for ITS Protocol (NTCIP) Requirements of this Project Special Provision.

7. Documentation verifying the VTMS is listed by an accredited 3rd party testing organization for conformance to UL48 and UL 1433.

8. All workmanship shall comply with IPC-A-610C, Class 2 titled "Acceptability of Electronic Assemblies".

9. Documentation providing proof PCB silicon conformal coating conformance to MIL-I-46058C Type SR and IPC-CC-830.

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REVISION OF SECTION 614
VARIABLE TOLL MESSAGE SIGN (VTMS)

10. Documentation that the sign's structural integrity is in Conformance to American Association of State Highway and Transportation Officials (AASHTO) Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals (Third Draft).

11. Documentation that the VTMS conforms to the Transient Protection and Vibration of the National Electrical Manufacturers Association (NEMA) Standard TS4, Section 2.

(b) *Sign Housing.* All component parts shall be easily and readily accessible by a single person for inspection and maintenance. The housing shall be weather tight, and compliant to the NEMA 3R Standard.

All parts shall be made of corrosion resistant materials, such as plastic, stainless steel or aluminum. Painted steel is not acceptable. No self-tapping screws shall be used. The exterior front face surfaces shall be finish coated by a system that meets or exceeds the AAMA Specification No. 2605. The finish shall be matte black. The main body of the sign housing shall be constructed of aluminum with a natural mill finish. All exterior seams shall be continuously welded by an inert ga process, except for the coated fascia material.

The glazing shall be constructed of clear polycarbonate sheets with surfaces that resist hazing from UV light. The glazing shall be protected by a coated 0.090 inch aluminum mask with apertures punched directly in front of each pixel. The coating shall meet or exceed the AAMA Specification No. 2605.

For surge protection, the system power shall be protected by two stages of transient voltage suppression devices. Tripping of each stage (or both if tripped simultaneously) of the surge protection shall cause the sign controller to call central and report the error condition (for dialup operation) or report the error condition to central on the next poll (for multi-drop operation). There shall be an option that is either enabled or disabled and is selected and downloaded from the central system control software to the sign controller. When this option is enabled, tripping of the second stage of surge protection shall prevent power from reaching any components of the sign until the surge protection has been replaced. When this option is disabled, the sign will continue to function normally after the second stage of surge protection is tripped.

(c) *Sign controller.* The sign controller shall be installed into the Communications Cabinet on the side of the road. The sign controller shall allow for control and monitoring of multiple VTMS inserts. The sign controller shall be a stand-alone microprocessor-based system, which does not require continuous communication with VTMS control software in order to perform most VTMS control functions.

The sign controller shall meet the following operational requirements:

1. Communicate using embedded NTCIP

2. Contain memory for storing changeable and permanent messages, schedules, and other necessary files for controller operation

3. Include a front panel user interface with graphical VFD or LCD and keypad for direct operation and diagnostics as described herein

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REVISION OF SECTION 614
VARIABLE TOLL MESSAGE SIGN (VTMS)

4. Contain a minimum of two NTCIP-compliant RS232 communication ports

5. Contain a minimum of one NTCIP-compliant Ethernet port with RJ45 connector

6. Have the ability to play volatile messages

7. Contain VTMS-specific control firmware (embedded software) that shall monitor all external and internal sensors and communication inputs and control the display modules as directed by external control software and the front panel interface

8. Ability for remote firmware upgrades that error check to eliminate firmware corruption

NTCIP shall be natively supported in the VTMS controller. External protocol converter or translator devices shall not be allowed. The sign controller shall be programmed to receive and transmit NTCIP compliant sign control commands from the central system control software and laptop computer. The controller shall have power-up and auto-restart capabilities with programmable default actions when recovering from a power off condition. A hardware watch dog circuit shall provide automatic reset of the controller and communications device. Central control shall have ability to perform a remote command for the controller and communications device reset. The controller shall be able to accept standard UPS shutdown commands via Ethernet or serial interface

The Controller shall perform all communication, control and feedback functions and shall not require an intermediate control device and be the only sign controller. Communication and control lines between the sign controller and the system interface circuits shall be opto-coupled.

(d) *Electronics.* All electronic components, except printed circuit boards, shall be commercially available, easily accessible, replaceable and individually removable using conventional electronics repair methods.

All Printed Circuit Boards (PCBs) shall be completely conformal coated with a silicone resin that meets the IPC CC-830 standard. The exception for this coating shall be the pixels on the front of the PCB of the LED motherboards and any components in sockets.

All integrated circuits shall be individually replaceable. Components shall be arranged so they are easily accessible for testing and replacement. All circuit designs shall utilize high quality electronic components and shall provide a meantime before failure of at least 3 years.

The sign and the controller shall be capable of operating with 120/240 VAC, 20 amp per leg, 60 Hz, single phase power. Each circuit in the sign shall be powered from a circuit breaker. Inside the roadside cabinet, all 120 VAC service lines shall be independently protected by a thermo-magnetic circuit breaker at the sign housing entry point. All 120 VAC wiring shall be located in conduit, pull boxes, raceways, or control cabinets as required by the National Electrical Code (NEC). No 120 VAC wiring shall be exposed within or outside of the sign housing.

The pixels shall be red/green/amber in color and utilize precision optical performance AlInGaP II LEDs (for red LEDs) or InGaN LEDs (for green LEDs) constructed of aluminum indium gallium

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REVISION OF SECTION 614
VARIABLE TOLL MESSAGE SIGN (VTMS)

phosphide. The brightness and color of each pixel shall be uniform over the entire face of the sign within the 30-degree cone of vision from minimum of 200 feet up to and including 1,100 feet in all lighting conditions. Each pixel shall be 40 candelas at 20mA as measured by the sum of the brightness of the individual LEDs in each pixel. The brightness of each LED shall be measured in accordance with CIE Standard Condition A, as described in CIE 127-2007, Technical Report: Measurement of LEDs.

Each pixel shall contain two strings of LEDs. The pixel strings shall be powered from a regulated DC power source and the LED current shall be maintained at 25 plus or minus three milliamperes per string to maximize life of the pixel. The failure of an LED in one string within a pixel shall not affect the operation of any other string or pixel. The LEDs shall be capable of operating in a temperature range of –40 degrees to +100 degrees C. The LEDs shall be moisture resistant epoxy with UV-A and UV-B inhibitors.

Pixel power drawn from the DC supplies shall not exceed 1.5 watts per pixel, including the driving circuitry.

A minimum of one photocell shall be installed on the sign. This device shall permit monitoring of light conditions at each sign location and automatic selection of light intensity levels. The method or algorithm used to calculate the intensity level shall be determined by the manufacturer and tested under real-world lighting conditions.

The power supplies shall be paralleled in a diode OR configuration such that one supply may completely fail and the sign will still be supplied with enough power to run 40% of all pixels. The power supply shall be located inside the roadside cabinet and not in the sign. The Contractor shall work with the vendor to determine proper cabling requirements from the cabinet to the sign.

All cables shall be securely clamped/tied in the sign housing. No adhesive attachments will be allowed.

The signs shall be capable of displaying ASCII characters 32 through 126 (including all upper and lower case letters and digits from 0 to 9) at any location in a message line.

The Contractor shall be responsible for locating the nearest electrical power and CDOT communication sources and connecting those sources to the appropriate terminations with the LED VTMS. The Contractor shall cooperate with the local electrical and communication utilities to establish a service accounts at the direction of the Engineer.

(e) *Communication.* The sign controller shall be capable of being controlled from the central system control software and the controller interface cabinet via RS-232 serial and Ethernet communications.

The sign controller shall include separate interfaces for communication with the central system control software and the controller interface cabinet.

The communications between the sign controller and the central system control software and controller interface cabinet shall comply with the NEMA NTCIP. The sign controller shall support

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REVISION OF SECTION 614
VARIABLE TOLL MESSAGE SIGN (VTMS)

all NTCIP conformance levels, conformance groups, objects, and minimum storage sizes and ranges as specified in this specification.

In addition to the standard Management Information Base (MIB) objects, the sign shall include any additional manufacturer-specific MIB objects required to support all of the sign and central software functionality defined in this specification.

Dial-up or hardwire multi-drop communication lines shall be protected by two stages of transient voltage suppression devices including MOVS and spark gap arrestor.

The sign controller shall be capable of being remotely reset from the central system control software.

The sign controller shall allow user-configuration of maximum and minimum temperature in which to turn fans on and off.

The sign shall have polling capability and at a minimum shall be capable of reporting the status of the following:

1. Pixel operational status that includes every string of every pixel

2. Sign and ambient temperature

3. DC power supply status

4. The current state (on or off) of each pixel, including any pixel errors, in the actual, currently displayed message without disturbing the message in any way. This shall be real time and shall not be based on a previous pixel test.

5. Communication failure log

6. UPS status

7. AC surge protector status

The controller software shall be capable of displaying static messages, including any character or set of characters

It shall be possible to flash any character or set of characters in an alternating message at the adjustable frequencies listed above for flashing messages. The flashing period shall be a sub-multiple of the associated alternating on time. It shall also be possible to flash any character or set of characters in a static message.

The sign controller shall monitor the photo cell circuits in the sign and convert the measured light intensity into the desired pixel brightness.

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VARIABLE TOLL MESSAGE SIGN (VTMS)

MANUFACTURER QUALIFICATIONS

The manufacturer shall supply experience documentation showing that the manufacturer has been in business, under the current corporate name, designing and manufacturing freeway LED Variable Message

Signs of a similar type for a minimum of 5 years; and that the manufacturer has in operation a minimum of 100 LED VMS. These 100 VMS shall be from 5 separate projects and operational for a minimum of 5 years.

CONSTRUCTION REQUIREMENTS

Contractor shall be fully responsible for the delivery of the sign to the installation site and any damages that occur in the installation delivery process.

The LED VTMS shall be installed in accordance with manufacturer's recommendations. A qualified factory representative shall be available on site to ensure proper installation and testing.

The Contractor shall submit a "VTMS acceptance test procedure" for acceptance and shall perform the test in the presence of CDOT and the manufacturer's representative. The test shall also include the use of the latest version of the NTCIP Exerciser, or equivalent, to demonstrate that no proprietary protocols have been used and that the local and central software are NTCIP compliant. The Contractor shall notify CDOT at least two weeks prior to the test date.

A minimum of 5 copies of the operations manual detailing the electrical schematics, operation and maintenance of the VTMS system, including software copies, shall be provided to the Department. Additional copies may be requested by CDOT. One of the 5 copies of the manual shall remain inside the sign controller cabinet on the side of the road. The remaining four copies shall be delivered to the CTMC at 425C Corporate Circle, Golden, CO 80401.

The LED VTMS shall include all labor, materials, and equipment necessary to complete the work, including the sign controller, controller interface box, sign housing, electronics, communications equipment, delivery to the installation site and standard warranty.

NTCIP Requirements

This portion of the specification defines the detailed NTCIP requirements for the VTMS covered by the Project specifications.

This specification references several standards through their NTCIP designated names. The following list provides the full reference to the current version of each of these standards. In many cases, the standard is

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REVISION OF SECTION 614
VARIABLE TOLL MESSAGE SIGN (VTMS)

more widely known by its original NEMA assigned number, in these cases, the NEMA number is also identified. The content of the NEMA standard is identical to that of the NTCIP standard.

Each NTCIP Component covered by these Project specifications shall implement the most recent version of the standard that is at the stage of Recommended or higher as of Sunday, April 03, 2001, including any and all Approved or Recommended Amendments to these standards as of the same date. It is the ultimate responsibility of the Contractor to monitor NTCIP activities to discover any more recent documents.

General Requirements: Transport Level

Each NTCIP Component shall comply with NTCIP 2202, (NEMA TS 3.Internet). NTCIP Components may support additional Transport Profiles at the manufacturer's option. Response datagrams shall use the same Transport Profile used in the request. Each NTCIP Component shall support the receipt of datagrams conforming to any of the identified Transport Profiles at any time.

Application Level

Each VTMS shall comply with NTCIP 2301, (NEMA TS 3.AP-STMF), as a Managed Agent and shall meet the requirements for Conformance Level 1 (NOTE – See Amendment to standard). SNMP shall be required and STMP shall not be required. An NTCIP Component may support additional Application Profiles at the manufacturer's option. Responses shall use the same Application Profile used by the request. Each NTCIP Component shall support the receipt of Application data packets at any time allowed by the subject standards.

Information Level

Each NTCIP Component shall provide Full, Standardized Object Range Support of all objects required by these procurement specifications, unless otherwise indicated below. The maximum Response Time for any object or group of objects shall be 200 milliseconds.

The vendor's software shall implement all mandatory objects of the mandatory conformance group defined in NTCIP 1201, (NEMA TS 3.4) Global Object Definitions:

- Configuration Conformance Group – Section 3.1
- Security Conformance Group (new in Amendment 1)

The vendor's software shall implement the mandatory objects of the optional conformance groups defined in NTCIP 1201, (NEMA TS 3.4), Global Object Definitions:

- Time Management Conformance Group – Section 3.3
- TimeBase Event Schedule Conformance Group – Section 3.4
- Report Conformance Group – Section 3.5

The vendor's software shall implement all mandatory objects of all mandatory conformance groups defined in NTCIP 1203, (NEMA TS 3.6) Object Definitions for Variable Message Signs:

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REVISION OF SECTION 614
VARIABLE TOLL MESSAGE SIGN (VTMS)

- Sign Configuration Conformance Group – Section 4.1
- Message Table Conformance Group – Section 4.6
- Sign Control Conformance Group – Section 4.7

The vendor's software shall implement all mandatory objects of the optional conformance groups defined in NTCIP 1203, (NEMA TS 3.6), Object Definitions for Variable Message Signs:

- GUI Appearance – Section 4.2
- Font Definition – Section 4.3
- VMS Sign Configuration – Section 4.4
- MULTI Configuration – Section 4.5
- Default Message – Section 4.8
- MULTI Error – Section 4.10
- Illumination/Brightness – Section 4.11
- Scheduling – Section 4.12
- Auxiliary I/O – Section 4.13
- Sign Status – Section 4.14
- Status Error – Section 4.15
- Pixel Error Status – Section 4.16
- Fan Error Status – Section 4.18
- Temperature Status – Section 4.17

The vendor's software shall implement the following optional objects defined in NTCIP 1203, (NEMA TS 3.6):

- dmsMessageBeacon – Section 2.6.1.1.1.8.6
- dmsSWReset – Section 2.7.1.1.1.1
- dmsMessageTimeRemaining – Section 2.7.1.1.1.4
- dmsShortPowerRecoveryMessage – Section 2.7.1.1.1.8
- dmsLongPowerRecoveryMessage – Section 2.7.1.1.1.9
- dmsShortPowerLossTime – Section 2.7.1.1.1.10
- dmsResetMessage – Section 2.7.1.1.1.11
- dmsCommunicationsLossMessage – Section 2.7.1.1.1.12
- dmsTimeCommLoss – Section 2.7.1.1.1.13

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VARIABLE TOLL MESSAGE SIGN (VTMS)

- dmsPowerLossMessage – Section 2.7.1.1.1.14
- dmsEndDurationMessage – Section 2.7.1.1.1.15
- dmsMultiOtherErrorDescription – Section 2.7.1.1.1.20
- dmsStatDoorOpen – Section 2.11.1.1.1.6
- fanFailures – Section 2.11.2.1.1.8
- fanTestActivation – Section 2.11.2.1.1.9
- tempMinCtrlCabinet – Section 2.11.4.1.1.1
- tempMaxCtrlCabinet – Section 2.11.4.1.1.2
- tempMinAmbient – Section 2.11.4.1.1.3
- tempMaxAmbient – Section 2.11.4.1.1.4
- tempMinSignHousing – Section 2.11.4.1.1.5
- tempMaxSignHousing – Section 2.11.4.1.1.6

The vendor's software shall implement the following tags (opening and closing where defined) of MULTI as defined in NTCIP 1203, (NEMA TS 3.6), Object Definitions for Variable Message Signs:

MULTI Tag

1 Field

2 Flash

3 Font

4 Hexadecimal Character

5 Justification Line

6 Justification Page

7 Moving Text

8 New Line

9 New Page

10 Page Time

11 Spacing – Character

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REVISION OF SECTION 614
VARIABLE TOLL MESSAGE SIGN (VTMS)

The Field Tag shall support the following field ID's:

Field Tag ID	Description
1	Time, 12-hour format (no AM/PM indicator)
2	Time, 24-hour format
3	Temperature in degrees Celsius
4	Temperature in degrees Fahrenheit
5	Day of week
6	Day of month
7	Month of year
8	Year, 2-digits
9	Year, 4-digits

Sizes and Ranges

All objects required by these procurement specifications shall support all values within its standardized range. The standardized range is defined by a size, range, or enumerated listing indicated in the object's SYNTAX field and/or through descriptive text in the object's DESCRIPTION field of the relevant standard. The following provides the current listing of known variances for this Project:

Object Reference		Minimum Project Requirements
NTCIP 1201 (TS 3.4)		
moduleTableEntry	2.2.3	Shall contain at least one row with moduleType equal to 3 (software). The moduleMake shall specify the name of the manufacturer, the moduleModel shall specify the manufacturer's name of the component and the modelVersion shall indicate the model version number of the component.
maxTimeBaseScheduleEntries	2.4.3.1	7
maxDayPlans	2.4.4.1	7
maxDayPlanEvents	2.4.4.2	7
maxEventLogConfigs	2.5.1	50
eventConfigMode	2.5.2.3	2,3,and 4
maxEventLogSize	2.5.3	200
maxEventClasses	2.5.5	7
maxGroupAddress	2.7.1	1

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VARIABLE TOLL MESSAGE SIGN (VTMS)

NTCIP 1203 (TS 3.6)

dmsNumPermanentMsg	2.6.1.1.1.1	50
dmsMaxChangeableMsg	2.6.1.1.1.3	50
dmsFreeChangeableMemory	2.6.1.1.1.4	50KB
dmsMaxVolatileMsg	2.6.1.1.1.6	50
dmsFreeVolatileMemory	2.6.1.1.1.7	50KB
dmsMsgMultiString	2.6.1.1.1.8.3	See attached table
dmsControlMode	2.7.1.1.1.1	2,4,5
numFonts	2.4.1.1.1.1	4
maxFontCharacters	2.4.1.1.1.3	127
vmsCharacterHeightPixels	2.3.1.1.1.1	4
vmsCharacterWidthPixels	2.3.1.1.1.2	5
vmsSignHeightPixels	2.3.1.1.1.3	7
vmsSignWidthPixels	2.3.1.1.1.4	35
vmsHorizontalPitch	2.3.1.1.1.5	66 or 70mm
vmsVerticalPitch	2.3.1.1.1.6	66 or 70mm
defaultBackgroundColor	2.5.1.1.1.1	0 (black)
defaultForegroundColor	2.5.1.1.1.2	9 (amber)
defaultJustificationLine	2.5.1.1.1.6	2,3,4
defaultJustificationPage	2.5.1.1.1.7	2,3,4
defaultFlashOn	2.5.1.1.1.3	0.5 to 5.0
defaultFlashOff	2.5.1.1.1.4	0.5 to 5.0
defaultPageOnTime	2.5.1.1.1.8	0.5 to 5.0
defaultPageOffTime	2.5.1.1.1.9	0.5 to 5.0
defaultCharacterSet	2.5.1.1.1.10	eightBit (2)
numActionTableEntries	2.9.1.1.1.1	15

Documentation

Software shall be supplied with full, electronic documentation containing ASCII versions of the following Management Information Base (MIB) files in Abstract Syntax Notation 1 (ASN.1) format:

- The relevant version of each official standard MIB Module referenced by the device functionality.
- If the device does not support the full range of any given object within a Standard MIB Module, a vendor specific version of the official Standard MIB Module with the supported range indicated in ASN.1 format in the SYNTAX and/or DESCRIPTION fields of the associated OBJECT TYPE macro. The filename of this file shall be identical to the standard MIB Module, except that it will have the extension ".man".
- A MIB Module in ASN.1 format containing any and all manufacturer-specific objects supported by the device with accurate and meaningful DESCRIPTION fields and supported ranges indicated in the SYNTAX field of the OBJECT-TYPE macros.
- A MIB containing any other objects supported by the device.

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VARIABLE TOLL MESSAGE SIGN (VTMS)

The vendor shall allow the use of any and all of this documentation by any party authorized by CDOT for systems integration purposes at any time initially or in the future, regardless of what parties are involved in the systems integration effort.

REVISION OF SECTION 614
UNINTERRUPTIBLE POWER SUPPLY FOR TOLL EQUIPMENT

DESCRIPTION

This work consists of furnishing and installing a rack mounted Uninterruptible Power Supply (UPS), batteries, transfer switch, disconnect switch, and power connections in a Contractor supplied Model 332 cabinet, side mounted cooling fan and polycarbonate base. The UPS system shall be capable of running essential control electronics, communications equipment, AVI Antennas and readers, ALPR Cameras, transaction status beacons, and other miscellaneous equipment, for at least 8 hours. Contractor shall prepare design tolling layout details and show all devices and respective UPS needed to maintain operations.

The UPS system shall be designed for a hot swap of components and shall not compromise existing operation of dynamic message signs or variable message signs. The unit shall provide for RS232 communication and contact closures for alarm functions.

MATERIALS

The UPS system shall provide "On-Line" dual conversion control. The UPS shall be rated per the following:

Input Voltage	85 VAC to 135 VAC line to neutral
Input Frequency	48 to 62 Hz
Output Voltage	120 VAC +/- 3%120/240 VAC, 1-Phase, 2 Wire plus Ground
Output Frequency	60 Hz
Power	VA required of running the toll equipment for a single and multi-direction toll point for up to 8 hours.

The unit shall be temperature rated to operate from 0 degree C to +40 degree C. The UPS system shall be capable of producing simultaneously-fully regenerated, conditioned power with true sine wave and continuous AC outputs with stand by capability.

The unit shall have a re-settable power event counter to record the number of power utility failures, a battery run-time counter and temperature compensated battery charging.

The UPS System shall be capable of providing continuous, fully conditioned (both voltage and frequency), regulated, sinusoidal (AC) power to selected devices such as controllers, modems, and 5 volt power supplies, and sign face drivers.

Wiring shall comply with national electrical code (NEC) standards and approved wiring methods. Properly rated SO/SJO cords shall be allowed to allow easy replacement of the UPS System.

The interconnect cable shall be protected with abrasion-resistant nylon sheathing.

The UPS shall consist of 2 major components, the electronics module and the battery system.

(a) The electronics module shall consist of the following:

1. True sine wave, high frequency inverter.

2. Minimum 3-stage, temperature compensated, battery charger

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REVISION OF SECTION 614
UNINTERRUPTIBLE POWER SUPPLY FOR TOLL EQUIPMENT

3. For connection from the electronics module to the battery system, a dedicated harness shall be provided with quick-release, keyed, circular connectors, and braided nylon sleeving over all conductors.

4. Local and remote control of UPS functions

5. Local and remote communications capabilities

(b) The Battery System shall consist of the following:

1. Shall meet the continuous 8 hour requirement to run electronics, communication equipment, and other toll equipment.

2. The batteries shall be comprised of extreme temperature, deep cycle Absorbed Glass Mat/Valve Regulated Lead Acid (AGM/VRLA) batteries that have been field proven and tested by the U.S. military.

3. Batteries shall be certified to operate at extreme temperatures from -40'C to +74'C.

4. The batteries shall be provided with appropriate interconnect wiring and a corrosion-resistant mounting trays and/or brackets appropriate for the location into which they will be installed.

5. Battery construction shall include heavy-duty, inter-cell connections for low-impedance between cells and heavy-duty plates to withstand shock and vibration.

(c) The UPS enclosure shall have forced air Cooling/Ventilation:

1. The UPS shall be forced air cooled by internally mounted, continuous fans.

2. Fan power shall be provided from the internal DC supply.

3. Air intake shall be through the front bottom of the unit, and air exhaust shall be out the rear top of the unit.

4. Intake and exhaust shall have bird/rodent mesh guard and filtration.

5. The thermal design, along with all thermal and ambient sensors, shall be coordinated with the protective devices before excessive component or internal cabinet temperatures are exceeded

The UPS System shall come standard with software, RS232 interface via a DB-9F connector, and Ethernet interface via RJ-45 connector allowing full, interactive, remote computer monitoring and control of the UPS functions. The software shall allow the user to set up all operational parameters either locally or remotely and test the functionality of the unit. The unit shall be capable of sending simple network management protocol (SNMP) alarm traps upon alarm conditions and also be configurable via built in web page interface.

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REVISION OF SECTION 614
UNINTERRUPTIBLE POWER SUPPLY FOR TOLL EQUIPMENT

The UPS System Alarm Function Monitoring shall come standard with a DB-9F connector with open collectors (40 V @ 20 mA) indicating:

(a) Loss of utility power
(b) Inverter failure
(c) Low battery

The UPS system front panel controls shall come standard with Power ON, Cold (DC) Start, Alarm Silence, Battery Test, Bypass Breaker and DC/Battery Breaker.

Reliability shall be calculated with mean time between failure (MTBF) as 100,000 hours based on component ratings.

CONSTRUCTION REQUIREMENTS

Contractor shall provide detailed design and installation plans for Department approval prior to installation. Power feeding the toll equipment shall first terminate in the ground mounted cabinet. Non-UPS power shall pass through the cabinet to power non-UPS loads. Power required for toll equipment backup shall feed through the UPS system. A bypass switch, rated for the designed system, shall be installed to bypass the UPS in the event of UPS failure or for system maintenance. A disconnect switch shall also be installed to disconnect UPS and line power from the toll equipment. The Contractor shall install the UPS output per manufacture recommendations. Serial and Ethernet cables shall be installed from the UPS system ground cabinet to the toll equipment communication device location. All wiring shall conform to the latest version of the NEC.

REVISION OF SECTION 614
UNINTERRUPTIBLE POWER SUPPLY FOR VARIABLE TOLL MESSAGE SIGN (VTMS)

DESCRIPTION

This work consists of furnishing and installing a rack mounted Uninterruptible Power Supply (UPS) for VTMS, batteries, transfer switch, disconnect switch, and power connections in a Contractor supplied Model 332 cabinet, side mounted cooling fan and polycarbonate base. The UPS system shall be capable of running essential sign control electronics, communication equipment, full LED sign faces allowing messaged display, and sign control for at least 8 hours.

The UPS system shall be designed for a hot swap of components and shall not compromise operation of VTMS. The unit shall provide for RS232 communication and contact closures for alarm functions.

MATERIALS

The UPS system shall provide "On-Line" dual conversion control. The UPS shall be rated per the following:

Input Voltage	85 VAC to 135 VAC line to neutral
Input Frequency	48 to 62 Hz
Output Voltage	120 VAC +/- 3% 120/240 VAC, 1-Phase, 2 Wire plus Ground
Output Frequency	60 Hz
Power	VA required of running 2 VTMS signs at one location during a power outage for up to 8 hours. The unit shall be temperature rated to operate from 0 degree C to +40 degree C.

The UPS system shall be capable of producing simultaneously-fully regenerated, conditioned power with true sine wave and continuous AC outputs with stand by capability.

The unit shall have a re-settable power event counter to record the number of power utility failures, a battery run-time counter and temperature compensated battery charging.

The UPS System shall be capable of providing continuous, fully conditioned (both voltage and frequency), regulated, sinusoidal (AC) power to selected devices such as controllers, modems, and 5 volt power supplies, and sign face drivers.

Wiring shall comply with national electrical code (NEC) standards and approved wiring methods. Properly rated SO/SJO cords shall be allowed to allow easy replacement of the UPS System.

The interconnect cable shall be protected with abrasion-resistant nylon sheathing.

The UPS shall consist of two major components, the electronics module and the battery system.

(a) The electronics module shall consist of the following:

1. True Sine wave, high frequency inverter.

2. Minimum 3-stage, temperature compensated, battery charger

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3. For connection from the electronics module to the battery system, a dedicated harness shall be provided with quick-release, keyed, circular connectors, and braided nylon sleeving over all conductors.

4. Local and remote control of UPS functions

5. Local and remote communications capabilities

(b) The battery system shall consist of the following:

1. Shall meet the continuous 8 hour requirement to run sign electronics, communication equipment, and half of the sign face with all LEDs illuminated at daytime brightness levels.

2. The batteries shall be comprised of extreme temperature, deep cycle Absorbed Glass Mat/Valve Regulated Lead Acid (AGM/VRLA) batteries that have been field proven and tested by the U.S. military.

3. Batteries shall be certified to operate at extreme temperatures from -40’C to +74’C.

4. The batteries shall be provided with appropriate interconnect wiring and a corrosion-resistant mounting trays and/or brackets appropriate for the location into which they will be installed.

5. Battery construction shall include heavy-duty, inter-cell connections for low-impedance between cells and heavy-duty plates to withstand shock and vibration.

(c) The UPS enclosure shall have forced air cooling/ventilation:

1. The UPS shall be forced air cooled by, internally mounted, continuous fans.

2. Fan power shall be provided from the internal DC supply.

3. Air intake shall be through the front bottom of the unit, and air exhaust shall be out the rear top of the unit.

4. Intake and exhaust shall have bird/rodent mesh guard and filtration.

5. The thermal design, along with all thermal and ambient sensors, shall be coordinated with the protective devices before excessive component or internal cabinet temperatures are exceeded

The UPS System shall come standard with software, RS232 interface via a DB-9F connector, and Ethernet interface via RJ-45 connector allowing full, interactive, remote computer monitoring and control of the UPS functions. The software shall allow the user to set up all operational parameters either locally or remotely and test the functionality of the unit. The unit shall be capable of sending simple network management protocol (SNMP) alarm traps upon alarm conditions and also be configurable via built in web page interface.

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UNINTERRUPTIBLE POWER SUPPLY FOR VARIABLE TOLL MESSAGE SIGN (VTMS)

The UPS System alarm function monitoring shall come standard with a DB-9F connector with open collectors (40 V @ 20 mA) indicating:

(a) Loss of utility power
(b) Inverter failure
(c) Low battery

The UPS System Front Panel Controls shall come standard with Power ON, Cold (DC) Start, Alarm Silence, Battery Test, Bypass Breaker and DC/Battery Breaker.

Reliability shall be calculated with mean time between failure (MTBF) as 100,000 hours based on component ratings.

CONSTRUCTION REQUIREMENTS

Contractor shall provide detailed design and installation plans for Department approval prior to installation. Power feeding the sign shall first terminate in the ground mounted cabinet. Non-UPS power shall pass through the cabinet to power non-UPS loads. Power required for sign backup shall feed through the UPS system. A bypass switch, rated for the designed system, shall be installed to bypass the UPS in the event of UPS failure or for system maintenance. A disconnect switch shall also be installed to disconnect UPS and line power from the sign. The Contractor shall install the UPS output into the VTMS power distribution panel per sign manufacture recommendations. Serial and Ethernet cables shall be installed from the UPS system ground cabinet to the sign communication device location. All wiring shall conform to the latest version of the NEC.

REVISION OF SECTION 614
TRAVEL TIME INDICATOR

Section 614 of the Standard Specifications is hereby revised for this Project to include the following:

DESCRIPTION

This work shall consist of furnishing and installing a Travel Time Indicator (TTI) in accordance with the Plans, these Special Provisions, and manufacturer's recommendations.

MATERIALS

A Travel Time Indicator system includes: a four channel multi-protocol RFID Reader 6204, or current version at the time of ordering, with power supply and composite cable, directional antennas, antenna signal cable and terminations, waterproofing mastic, serial surge suppressor, device configuration software, and all other related mounting hardware, cabling, and adaptors.

Travel Time Indicator shall include:

1. RFID Reader 6204 with power supply.

   The TTI reader shall be part number 75-0302-3854-9 6204 - 4-pt ISO C B 10374 ASTMV6 PS111 T21, as manufactured by 3M Company – MVSS, 3M Center, Bldg 235-3A-09, St. Paul, MN 55144-1000, Phone: 1-877-777-3571, Fax: 1-800-591-9293. The Contractor must specify that v3.8 of the init.py script be preinstalled in the reader at the time of order.

2. Composite Cable

   The composite cables shall include the following part numbers based on length required at each site:

   A. 20 feet (6 meters), RJ-45 terminated, 3M SKU: 75-0302-0132-3
   B. 7 feet (2 meters), RJ-45 terminated, 3M SKU: 75-0302-0131-5

3. Directional Antenna

   The antenna shall be per the below table or approved equivalent and shall include a mount bracket. One antenna is required per vehicle detection direction and per port.

Application	Field of	3M SKU
Overhead Mount	22°	75-0302-0147-1
Side or Overhead	36°	78-0060-1048-8
Side or Overhead	42°	78-0060-1044-7

4. Antenna coaxial cable and terminations.

   A. The type of antenna signal cable used is determined by the distance from the reader to the antenna. Total signal loss on antenna cable runs shall remain below the manufacturer's recommendations for the intended application. At a transponder operating frequency of 916 megahertz (Mhz) the loss of the total cable assembly,

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including any jumpers or intermediate connectors, shall be less than 3 decibels (dB) for TTI installations. For antenna runs installed using a continuous cable, the following cable types shall be used up to the prescribed maximum length.

(1) For runs 50 feet or less – Land Mobile Radio (LMR) - LMR-400.
(2) For runs from 51-100 feet - LMR-600
(3) For runs from 101-150 feet - LMR 900

B. Signal cable shall be terminated with weatherproof male N-type crimp on straight plugs that have the following properties. When available, terminations with soldered center conductor and crimped outer ferrule shall be used.

(1) Ferrule – Copper with Albaloy (tin-zinc-copper alloy) plating
(2) Contact pin – Brass with minimum 15 micrometer gold plating
(3) Retaining ring – 304 stainless steel
(4) Gasket – Silicone
(5) Insulator – Teflon
(6) Shell/Body – Brass with Albaloy plating
(7) Impedance – 50 ohms
(8) Insulation resistance - Greater than 5,000 megaohms
(9) Peak operating voltage – 1,500 volts
(10) Water-proofing mastic for antennas connections.

When LMR-900 cable is required, cable reduction jumpers not to exceed 4 feet in length, unless otherwise Approved by the Engineer, may be used in the cabinet at the reader-side connection. In these cases, it is the contractor's responsibility to ensure that the signal loss on the entire installed cable assembly does not exceed 3dB at 916 MHz for TTI installations or manufacturer's recommendations for alternate applications.

5. Serial surge suppressor shall be Wavetronix Click WX-CLK-200 or equivalent.

6. Device configuration software as provided by the manufacturer.

7. Mounting hardware, cabling, and adaptors including but not limited to: 0.75 inch Type 201 stainless steel strap with Type 201 stainless steel buckles, Liquidtight flexible conduit with compatible connectors.

CONSTRUCTION REQUIREMENTS

The Travel Time Indicator reader shall be mounted inside the communications cabinet allowing room for all communication cable connections. Self-tapping screws shall be used to mount the reader to the cabinet for ease of removal.

The power supply shall be mounted to Deutsches Institut für Normung (DIN) rail inside the communications cabinet. All wiring shall conform to the most current version of the National Electric Code (NEC).

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The Contractor shall supply and install one-inch type 201 stainless steel strap used in conjunction with type 201 stainless steel buckles which shall be used to band the antenna mount to the structure at the mounting height directed by the Engineer. The Antenna shall be mounted horizontally polarized using the included stainless hardware. The antenna shall be oriented such that it intersects with the oncoming traffic at a 45 degree angle, and is aimed to the center of lanes detected.

The Contractor shall install flexible conduit from the communication cabinet enclosure to the structure for signal cable and power cable installation. Holes made in mounting structures shall be the minimum size necessary to secure the conduit connectors and shall not exceed 1.5 inches in diameter. All holes shall be free of burs and sharp edges prior to the installation of all cable, conduit, and conduit nipples. All cable entrances in structures, conduits, and enclosures shall be sealed and waterproofed. All wiring and electrical connections shall be performed in conformance with the latest version of the NEC.

The signal cable shall connect radio frequency (RF) input/output channels from the TTI reader to the TTI directional antennas – one cable per antenna. The Contractor shall route signal cable through existing structures or through new flexible or rigid polyvinylchloride (PVC) conduit mounted to existing structures as shown on the plans. Each signal cable shall be a continuous cable, with no splices, terminated with male N-type crimp on straight plugs on both ends. Installations that require cable lengths exceeding 100 feet shall utilize lower loss cable as to not exceed 3-4dB of loss per run. All signal cables shall be labeled on both ends with ultraviolet (UV) light resistant colored tape before installation. The same color label shall be used on both ends of one cable and label colors shall not repeat at the same installation site. Labels shall be installed such that they are distinguishable from the ground wire.

The Contractor shall ensure strain relief and drip loops in coaxial antenna cable. The Contractor shall provide full support to all coaxial cable not in conduit and wiring trays. All cable entrances in conduits, conduit entrances in structures and cabinets shall be sealed and waterproofed. Conduit and signal cable shall not enter the top of the communications cabinet that houses the TTI reader. Entering through the bottom of the cabinet is preferred, although side entrances will be permitted. Waterproofing mastic shall be applied at all antennas to signal cable connections following manufacturer's recommendations.

The Contractor shall connect antenna signal cables to the TTI reader per the following table:

		TTI Reader Antenna Port			
		1	2	3	4
Traffic Detection Direction	General Purpose Lanes*	Northbound	Southbound	Eastbound	Westbound
	Managed Lanes*	Eastbound	Westbound	Northbound	Southbound
	Uni-Directional Multi-Pickup (All NB, SB, EB, or WB Detection)**	Lane/s closest to median or managed lane/s	Lane/s 2nd closest to median	Lane/s 3rd closest to median	Lane/s 4th closest to median or closest to shoulder or ramp/s

*For multi-directional readers or sites where 2 or fewer antennas are used per traffic direction.
**For uni-directional readers that use 2 or more antennas for traffic in the same direction.

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TRAVEL TIME INDICATOR

RS-232 serial and Ethernet communications from the TTI reader shall terminate on their respective surge suppression device. The connection to serial surge suppressor shall allow access to the reader via laptop computer.

The Contractor shall configure the TTI in accordance with manufacturer's recommendations and the following specifications:

1. CalTrans Title 21 and ISOC protocols enabled for tag detection with only active antenna channels enabled
2. Power levels set to the minimum needed for reliable transponder detection.

The unit shall be configured for serial communication with the following:

1. 19,200 bits per second
2. 8 data bits
3. No parity
4. 1 stop bit
5. No flow control

TPS script v 3.8 shall be configured in the TTI reader per CDOT guidelines with the following:

1. interval: 60 seconds
2. Reader ID: as shown on the plans
3. Heartbeat: 10 seconds

The Contractor shall follow procedures in the Testing and Integration Plan to achieve Acceptance of the installation.

The TTI will be installed, and shall include warranty, documentation, RFID Reader 6204, power supply, antenna mounts, antennas, waterproofing mastic, conduit and connectors, installation hardware, all necessary wiring, test equipment, labor, and all other items necessary to complete the work. Each TTI shall include aiming the antenna, complete in place, in accordance with the Plans and these Special Provisions. TTI shall include reader connections, testing, warranty, documentation, all necessary cabling (excluding signal cable), all equipment and labor necessary for installation, and all other items necessary to complete the work.

REVISION OF SECTION 614
COMMUNICATIONS CABINET

Section 614 of the Standard specifications is hereby revised for this Project to include the following:

DESCRIPTION

This work consists of furnishing and installing ground-mounted Communications Cabinets.

The Communications Cabinet (Type 332) shall be furnished for designated locations to house and protect field equipment, communications equipment, toll point Uninterruptible Power Supplies (UPS), batteries and power connections.

The Communications Cabinet (Type 332D) shall be furnished for designated locations to house and protect field equipment, communications equipment, UPS, batteries and power connections.

MATERIALS

Communication Cabinets. The nominal dimensions shall be as shown in Table 1 below. Some variance from these dimensions may be accepted at the Department's discretion.

Table 1 - Communications Cabinet Types

Cabinet Type	Nominal Dimensions
Communications Cabinet (Type 332)	67" (H) × 24" (W) × 30" (D)
Communications Cabinet (Type 332D)	67" (H) × 49" (W) × 30" (D)

The following apply to all ground mounted Communications Cabinets:

Each Cabinet shall be UL 508A Industrial Control Panels listed and conform to the National Electrical Manufacturers Association (NEMA) Type 3R rating. The Cabinets shall be H-32 aluminum conforming to the requirements of American Society for Testing and Materials (ASTM) B209 *Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate*.

All bolts, clamps, fasteners, hinges, latches, nuts and screws shall be stainless steel, unless an alternative corrosion proof material has been Accepted in writing by the Department.

A Cabinet grounding stud shall be provided in the vicinity of the ground bus mounted on the back panel and shown on the Plans.

All fabricated materials and added components must be free from burrs and sharp edges. Exterior seams of the Cabinet shall be continuously welded with edges ground smooth to a 0.03 inch radius. All welding shall be done with gas tungsten arc welds that comply with AWS B2.1-22-015 *Standard Welding Procedure Specification for Gas Tungsten Arc Welding of Aluminum* and C5.6 *Recommended Practices for Gas Metal Arc Welding*. All welds shall be neatly formed and free of blisters, blowholes, cracks and other irregularities.

The Cabinet door openings shall be designed to prevent dust and moisture intrusion in conformance to NEMA 3R requirements. All flange joints shall be welded or continuously formed. The doors shall have an adequately sized, oil- resistant gasket that provides a uniform seal with the door frame surface in conformance with NEMA 3R requirements and shall be permanently bonded to the door. The door shall utilize a continuous stainless steel hinge that allow for door removal from the hinge side. Hinges shall be

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REVISION OF SECTION 614
COMMUNICATIONS CABINET

mounted such that the Cabinet door opens out to the left, unless otherwise specified on the Plans, Project Details or as specified by the Department.

Hinges shall be mounted with appropriately sized stainless steel hardware. The door shall be equipped with a hasp and staple for padlocking and Corbin #2 key lock, without impacting the NEMA 3R rating. A document holder constructed of high-impact thermoplastic shall be provided for each Cabinet and permanently mounted to the inside of the door. The Contractor shall insert a copy of the communications Cabinet Bill of Materials (BOM), individual Cabinet component specification sheets and an as built electrical/low-voltage wiring diagram for the Cabinet in the document holder.

A DIN rail shall be provided with each Cabinet.

Internal Cabinet Lighting. Provide a minimum of two light-emitting diode (LED) light strips per door opening to provide illumination for the entire Cabinet interior. Each door opening shall also be equipped with a door switch to activate the Cabinet lighting. LED light strips and door switches shall be mounted such that they do not interfere with use of rack space or other devices in the Cabinet and shall be easily removable for replacement.

Ventilation. Provide two (2), independently wired, 100 CFM exhaust fans near the top of the Cabinet that are controlled by independent adjustable thermostats. Provide filtered air intake ports with removable and replaceable filter on the bottom third of each access door.

Grounding Bus Bar. Equipment ground bus bars shall be provided for each Cabinet. Bus bars shall be UL listed and be fabricated from solid, 110 alloy copper. Each bus bar shall accommodate a minimum of seven (7) lug positions. The equipment grounding bus bar shall provide an additional 25 percent lug position capacity over the amount of terminations utilized for the Project. Multiple bus bars may be used within each Cabinet, if the interior dimensions of the Cabinet do not allow for the use of a larger bus bar. Each bus bar shall include insulators, stand-off brackets, snap on covers, and stainless steel mounting hardware.

Foundation. Each Communication Cabinet shall include a polymer concrete or poured concrete pad that extends at least 2.5 feet beyond the Cabinet base on each Cabinet door side and at least 6 inches beyond the Cabinet base on the other 2 sides. The Cabinet base shall be sealed around conduits.

Receptacles. Provide a minimum of one 15-amp NEMA 15-R 120VAC duplex GFCI receptacle labeled “Convenience Outlet” and one 15-amp NEMA 15-R 120VAC duplex receptacle labeled “ITS Equipment”, each with a dedicated circuit.

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COMMUNICATIONS CABINET

Power Conditioner. The power conditioner shall be installed in the cabinet to provide both fully regenerated, conditioned power with true sine wave and continuous AC outputs to controllers and communication devices, simultaneously. The power conditioner shall be designed for outdoor use, support an operating temperature range of -40°F to +165°F, be operational in humidity levels of 0% to 95% (non-condensing) and operate at an altitude ranging from sea level to two miles above sea level. It shall utilize an input voltage of 120 VAC, 40 to 70 Hz and an output voltage of 120 VAC (± 3%), user selectable 50 to 60 Hz (± 0.25%).

The power conditioner shall support a maximum output of 1400W at 120 V. It shall have a total harmonic distortion not exceeding 3.0%. The power conditioner shall utilize input and output electrical connectors conforming to the IEC 60320-1 *Appliance Couplers for Household and Similar General Purposes* specification. Its dimensions shall not exceed 1.7 inches (H) × 11 inches (W) × 8.5 inches (D) and its weight shall not exceed 5 lbs. One power conditioner shall be provided with each cabinet, and shall be of higher capacity if necessary to accommodate the UPS design.

An integral component of the power conditioner shall be a factory-installed power strip. The power strip shall have six (6) front facing NEMA Type 5-20R outlets. The power strip shall be rated for 20 A at 120 VAC. It shall have an energy rating of 630 Joules, clamping voltage of 500 V and EMI/RFI noise filter of 150 KHz to 100 MHz at up to 43 dB. The power strip shall have a recessed power switch and a power cord of not less than 2.5 feet. The dimensions of the power strip shall be 10 inches (L) × 1.63 inches (W).

Load Center. Each load center shall be readily accessible on the interior of the cabinet close to a door. The load center shall provide a main and a minimum of four (4) branch circuits. The neutral and ground bars shall be tied together in the load center. The ground bar shall be connected to the service disconnect using a bonding strap. The ground bar shall be connected to a grounding electrode using grounding conductors conforming to the requirements of Article 250.122 of the NEC. The grounding electrode shall conform to the requirements of Articles 250.52 through 250.70 of the NEC.

Specific to the Communications Cabinet (Type 332): Contractor shall provide a Cabinet rack at full-height standard Electronics Industry Alliance (EIA), 19-inch rack, with a minimum of one pullout drawer.

Specific to the Communications Cabinet (Type 332D): Contractor shall provide 2 Cabinet racks at full-height standard Electronics Industry Alliance (EIA), 19-inch racks, with a minimum of one pullout drawer.

CONSTRUCTION REQUIREMENTS

Conduit into all Cabinets for electrical wiring, specific field device low-voltage control cabling, waveguides and fiber optic cabling, shall be plugged with a manual plug (no foam sealant is allowed). After installation, the top of the cabinet should be approximately 5 feet above the prevailing ground line.

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COMMUNICATIONS CABINET

Conduit into the Cabinet for electrical wiring, specific field device low-voltage control cabling, and fiber optic cabling, shall be plugged with a manual plug (no foam sealant is allowed).

Cable management and strain relief shall be employed within the communications Cabinet. Cables shall be labeled and neatly organized using cable ties and/or velcro. Velcro shall be used on fiber optic jumper cables or bundles of cables containing fiber optic jumper cables.

See project specific Testing & Integration Plan for additional requirements.

REVISION OF SECTION 614
COMMUNICATIONS CABINET (TYPE I)

Section 614 of the Standard specifications is hereby revised for this Project to include the following:

DESCRIPTION

This work consists of furnishing and installing communications cabinets at designated Intelligent Transportation System (ITS) field device locations to house and protect electrical power components. Communication Cabinet (Type 1) shall be furnished and installed at field device sites to house and protect electrical power components, DIN rails, field equipment, serial servers, communications telemetry equipment and fiber optic termination panels. Each Communication Cabinet (Type 1) shall be pole-mounted.

MATERIALS

The nominal dimensions shall be as shown in Table 1 below. Some variance from these dimensions will be accepted, at the Department's discretion.

Table 1 - Communications Cabinet Types

Cabinet Type	Dimensions	Maximum Weight (w/o back panel)
Communications Cabinet (Type 1)	36" (H) × 24" (W) × 18" (D)	N / A

Cabinets shall be UL 508A Industrial Control Panels listed and conform to National Electrical Manufacturers Association (NEMA) Type 3R rating. Communications cabinets shall be H-32 aluminum conforming to the requirements of ASTM B209 *Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate*.

All bolts, clamps, fasteners, hinges, latches, nuts and screws shall be stainless steel, unless an alternative corrosion proof material has been Approved by the Department and is in writing.

A Cabinet grounding stud shall be provided in the vicinity of the ground bus mounted on the back panel as shown on the Plans.

All fabricated materials and added components must be free from burrs and sharp edges. Exterior seams of the cabinet shall be continuously welded with edges ground smooth to a 0.03 inch radius. All welding shall be done with gas tungsten arc welds that comply with AWS B2.1-22-015 *Standard Welding Procedure Specification for Gas Tungsten Arc Welding of Aluminum* and C5.6 *Recommended Practices for Gas Metal Arc Welding*. All welds shall be neatly formed and free of blisters, blowholes, cracks and other irregularities. All bolts, clamps, fasteners, hinges, latches, nuts and screws shall be stainless steel, unless an alternative corrosion proof material has been Approved by the Department and is in writing.

The Cabinet door openings shall be designed to prevent dust and moisture intrusion in conformance to NEMA 3R requirements. All flange joints shall be welded or continuously formed. The doors shall have an adequately sized, oil- resistant gasket that provides a uniform seal with the door frame surface in conformance with NEMA 3R requirements and shall be permanently bonded to the door. The door shall utilize a continuous stainless steel hinge that allow for door removal from the hinge side. Hinges shall be mounted such that the Cabinet door opens out to the left, unless otherwise specified on the Plans, Project Details or as specified by the Department.

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Hinges shall be mounted with appropriately sized stainless steel hardware. The door shall be equipped with a hasp and staple for padlocking and Corbin #2 key lock be utilized in place of the hasp and staple if the NEMA 3R rating can be maintained. A document holder constructed of high-impact thermoplastic shall be provided for each communications Cabinet and permanently mounted to the lower portion of the inside door. The Contractor shall insert a copy of the Communications Cabinet Bill of Materials (BOM), individual Cabinet component specification sheets and an as built electrical/low-voltage wiring diagram of the Cabinet in the document holder.

Back Panels

Back panels shall be constructed of 0.10 inch Type 5052-H32 aluminum alloy, unless otherwise specified by the

Department. Two back panels and associated mounting hardware shall be included with each Cabinet and be rated for use in NEMA 3R Cabinets. The back panel shall be approximately 1-inch less than the inside dimensions. The back panel shall be 1-inch thick, with air space to allow for mounting screws to be used from either side without protrusion through the opposing face. The back panel shall be mounted within the communications Cabinet with a minimum of four screws on an adjustable sliding channel.

Outlet Box

The communications Cabinet shall contain a 4 inch square junction box attached to the back panel and near the door opposing the external service disconnect on side B. Each junction box shall be constructed of drawn or welded steel and have a minimum depth of 1.25 inches. Each junction box shall include knockouts and clamps for conduit and cables, as appropriate. Steel box covers shall be provided with each junction box as appropriate for the specific communications Cabinet application, e.g., duplex receptacles and/or duplex GFCI receptacles.

A duplex NEMA 5-15R receptacle shall be provided within the outlet box opposing the external service disconnect. NEMA 5-15R receptacles shall be rated for 125 VAC, 0.5 HP and 15 A. It shall be of commercial grade quality and be manufactured from high strength nylon. NEMA 5-15 receptacles shall have two poles, three wires and include a self-grounding strap to insure ground contact.

Duplex NEMA 5-15R GFCI receptacles shall be provided within the outlet box mounted to the backplane of side A. NEMA 5-15R GFCI receptacles shall be rated for 125 VAC, 0.5 HP and 15 A. It shall be of commercial grade quality and manufactured from high strength nylon.

Both duplex NEMA 5-15R and duplex NEMA 5-15R GFCI receptacles shall be UL listed.

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REVISION OF SECTION 614
COMMUNICATIONS CABINET (TYPE I)

Power Conditioner

The power conditioner shall be a Clary SP400U Universal Power Conditioner. The power conditioner shall be designed for outdoor use, support an operating temperature range of -40°F to +165°F, be operational in humidity levels of 0% to 95% (non-condensing) and operate at an altitude ranging from sea level to two miles above sea level. It shall utilize an input voltage of 120 VAC, 40 to 70 Hz and an output voltage of 120 VAC (± 3%), user selectable 50 to 60 Hz (± 0.25%). The power conditioner shall support an output current of 4.8 A (400 W/570 VA). It shall have a total harmonic distortion not exceeding 3.0%. The power conditioner shall utilize input and output electrical connectors conforming to the IEC 60320-1 *Appliance Couplers for Household and Similar General Purposes* specification. Its dimensions shall not exceed 1.7 inches (h) × 11 inches (w) × 8.5 inches depth and its weight shall not exceed 5 lbs. One power conditioner shall be provided with each communications Cabinet.

An integral component of the power conditioner shall be a factory-installed power strip. The power strip shall have six front facing NEMA Type 5-15R outlets. The power strip shall be rated for 15 A at 120 VAC. It shall have an energy rating of 630 Joules, clamping voltage of 500 V and EMI/RFI noise filter of 150 KHz to 100 MHz at up to 43 dB. The power strip shall have a recessed power switch and a power cord of not less than 2.5 feet. The dimensions of the power strip shall be 10 inches (L) × 1.63 inches (W).

DIN Rails

Each communications Cabinet shall utilize standard 1.38 inch DIN rails. The DIN rails shall be of steel construction with a coating for corrosion resistance. The DIN rails shall utilize 0.25 inch × 0.71 inch slots for fastening to the back panel located in each communications Cabinet. The spacing of the DIN rail slots shall be 0.98 inch center-to-center. DIN rails and associated mounting hardware for attachment to the back panel shall be provided with each communications Cabinet in the lengths and quantities specified in the Project Details.

12 VDC Power Supply

The 12 VDC power supply shall support an input voltage range of 85-264 VAC and frequency range of 47-63 Hz. It shall have a typical efficiency of at least 76% and typical AC current of 1.6 A at 115 VAC. The 12 VDC power supply shall provide an output voltage of 12 VDC and have a current rating of 6.3 A. It shall support an output current range of 0 to 6.3 A and have a rated power of 75 W. The 12 VDC power supply shall have overload protection of 105-150% for its rated output power and overvoltage protection for voltages of 15-16.5 VDC. It shall be designed for an operating temperature of +14°F to +140°F and humidity levels of 20% to 90% (non-condensing). The 12 VDC power supply shall conform to the following standards: IEC 60068-2-6 *Environmental Testing (Vibration)* and UL 508 *Industrial Control Equipment*. It shall be DIN rail mountable, have dimensions not exceeding 5 inches (h) × 2.25 inches (w) × 4 inches (d) and a weight of not more than 1.5 lb. One 12 VDC power supply shall be provided with each communications Cabinet.

Service Disconnect. Each service disconnect shall be readily accessible and installed on the exterior of the Cabinet close to the door so that the center of the grip of the operating handle of the circuit breaker, when in its highest position, is not more than 6 feet 7 inches above the ground or as required per Article

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COMMUNICATIONS CABINET (TYPE I)

240.24 of the NEC. The neutral from the power source or service enclosure shall be connected to the ground bar in the service disconnect. The ground bar shall be connected to the service disconnect using a bonding strap.

The ground bar shall be connected to a grounding electrode using grounding conductors conforming to the requirements of Article 250.122 of the NEC. The grounding electrode shall conform to the requirements of Articles 250.52 through 250.70 of the NEC. The service disconnect shall feed a duplex NEMA 5-15R mounted on the inside of the Cabinet.

Pole Mounting Kit

Each Cabinet, designated for mounting on a pole, shall include a pole mounting kit suitable the pole diameters for which the Cabinet will be mounted. Each pole mounting kit shall include channel bars (for attachment to factory mounting holes on the back of the Cabinet), pole shims (to prevent Cabinet movement against pole), stainless steel straps and all other associated mounting and sealing hardware. The channel bars, pole shims and associated mounting hardware shall be manufactured from either galvanized steel or stainless steel. Mounting holes on the back of the Cabinet shall be installed at the factory (Cabinet manufacturer) to assure NEMA 3R integrity along with all factory-recommended mounting and sealing hardware. Field installation or modification of mounting holes shall be prohibited.

CONSTRUCTION REQUIREMENTS

Each Cabinet shall have tapped pads to provide for the mounting of a back panel as specified herein. Conduit accesses into the Cabinet for electrical wiring, specific field device low-voltage control cabling, waveguides and fiber optic cabling, shall be plugged with a manual plug (no foam sealant is allowed). After installation, the top of the Cabinet should be approximately 5 feet above the prevailing ground line.

REVISION OF SECTION 614
COMMUNICATIONS CABINET (TYPE 2)

Section 614 of the Standard specifications is hereby revised for this Project to include the following:

DESCRIPTION

This work consists of furnishing and installing Communications Cabinets at locations where an Uninterruptible Power Supplies (UPS) and batteries are not required to house and protect field equipment, communications equipment and power connections.

Communication Cabinet (Type 2) shall be a Caltrans 336S and shall be pole-mounted at all CCTV lowering device locations. Ground-mounted applications shall include a raised polymer concrete or poured concrete pad and base.

MATERIALS

The nominal dimensions shall be as shown in Table 1 below. Some variance from these dimensions will be accepted, at the Department's discretion.

Table 1 - Communications Cabinet Types

Cabinet Type	Dimensions	Maximum Weight (w/o back panel)
Type 2	46 inches (H) × 24 inches (W) × 22 inches (D)	N / A

Each Cabinet shall be UL 508A *Industrial Control Panels* listed and conform to a NEMA Type 3R rating. Cabinet shall be H-32 aluminum conforming to the requirements of ASTM *B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.*

All bolts, clamps, fasteners, hinges, latches, nuts and screws shall be stainless steel, unless an alternative corrosion proof material has been Approved in writing by the Department.

A Cabinet grounding stud shall be provided in the vicinity of the ground bus mounted on the back panel as shown on the Plans.

All fabricated materials and added components must be free from burrs and sharp edges. Exterior seams of the Cabinet shall be continuously welded with edges ground smooth to a 0.03 inch radius. All welding shall be done with gas tungsten arc welds that comply with AWS B2.1-22-015 *Standard Welding Procedure Specification for Gas Tungsten Arc Welding of Aluminum and C5.6 Recommended Practices for Gas Metal Arc Welding.* All welds shall be neatly formed and free of blisters, blowholes, cracks and other irregularities.

The Cabinet door openings shall be designed to prevent dust and moisture intrusion in conformance to NEMA 3R requirements. All flange joints shall be welded or continuously formed. The doors shall have an adequately sized, oil- resistant gasket that provides a uniform seal with the door frame surface in conformance with NEMA 3R requirements and shall be permanently bonded to the door. The door shall utilize a continuous stainless steel hinge that allow for door removal from the hinge side. Hinges shall be mounted such that the Cabinet door opens out to the left, unless otherwise specified by the Department.

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REVISION OF SECTION 614
COMMUNICATIONS CABINET (TYPE 2)

Hinges shall be mounted with appropriately sized stainless steel hardware. The door shall be equipped with a hasp and staple for padlocking and a Corbin #2 key lock without impacting the NEMA 3R rating. A document holder constructed of high-impact thermoplastic shall be provided for each Cabinet and permanently mounted to the inside of the door. The Contractor shall insert a copy of the Cabinet Bill of Materials (BOM), individual Cabinet component specification sheets and an as built electrical/low-voltage wiring diagram of the Cabinet in the document holder.

Internal Cabinet Lighting. Provide a minimum of two light-emitting diode (LED) light strips per door opening to provide illumination for the entire Cabinet interior. Each door opening shall also be equipped with a door switch to activate the Cabinet lighting. LED light strips and door switches shall be mounted such that they do not interfere with use of rack space or other devices in the Cabinet and shall be easily removable for replacement.

Ventilation. Provide 2, independently wired, 100 CFM exhaust fans near the top of the Cabinet that are controlled by independent adjustable thermostats. Provide filtered air intake ports with removable and replaceable filter on the bottom third of each access door.

Grounding Bus Bar. Equipment ground bus bars shall be provided for each Cabinet. us bars shall be UL listed and be fabricated from solid, 110 alloy copper. Each bus bar shall accommodate a minimum of 7 lug positions. The equipment grounding bus bar shall provide an additional 25 percent lug position capacity over the amount of terminations utilized for the Project. Multiple bus bars may be used within each Cabinet, if the interior dimensions of the Cabinet do not allow for the use of a larger bus bar. Each bus bar shall include insulators, stand-off brackets, snap on covers, and stainless steel mounting hardware.

Insulation. Provide R-4 insulation on interior, sides, top and all doors.

Cabinet Layout. Each Communications Cabinet shall be physically divided into 2 sides by a sliding back plane. The front side will house all associated ITS electronics, communication device hardware and a duplex GFCI convenience outlet. The back side will house the power and fiber resources, such as: 120V main power feeding the Cabinet, the Clary power conditioner, 6-outlet power strip, equipment power supplies, the fiber termination panel and slack fiber.

Back Plane (Front and Back Sides).The back plane shall be constructed of 0.10 inch Type 5052-H32 aluminum alloy, unless otherwise specified by the Department. A (two-sided) back plane and associated mounting hardware shall be included with each communications Cabinet and be rated for use in NEMA 3R Cabinets. The back plane shall be approximately 1-inch less on each side than the inside dimensions. The back plane shall have at least 1-inch of air space between the two sides to allow for mounting screws to be used from either side without protrusion through the opposing face. The back plane shall be mounted within the communications Cabinet with a minimum of four screws on an adjustable sliding channel.

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COMMUNICATIONS CABINET (TYPE 2)

Outlet Box.

(Front and Back Sides). The Cabinet shall contain a 4-inch square junction box attached to the back plane of the front side and near the door opposing the external service disconnect on the side wall of the back side. Each junction box shall be constructed of drawn or welded steel and have a minimum depth of 1.25 inches. Each junction box shall include knockouts and clamps for conduit and cables, as appropriate. Steel box covers shall be provided with each junction box as appropriate for duplex receptacle and/or a duplex GFCI receptacle.

A duplex NEMA 5-15R GFCI receptacle shall be provided within the outlet box mounted to the backplane of the front side, and be labeled "Convenience Outlet". NEMA 5-15R GFCI receptacles shall be rated for 125 VAC, 0.5 HP and 15 A. It shall be of commercial grade quality and manufactured from high strength nylon.

A duplex NEMA 5-15R receptacle shall be provided on the back side within the outlet box opposing the external service disconnect, and be labeled "ITS Equipment". The NEMA 5-15R receptacle shall be rated for 125 VAC, 0.5 HP and 15 A. It shall be of commercial grade quality and be manufactured from high strength nylon. The NEMA 5-15 receptacle shall have two poles, three wires and include a self-grounding strap to insure ground contact.

Both duplex NEMA 5-15R and duplex NEMA 5-15R GFCI receptacles shall be UL listed.

Power Conditioner (Back Side). The power conditioner shall be installed in the Cabinet to provide both fully regenerated, conditioned power with true sine wave and continuous AC outputs to controllers and communication devices, simultaneously.

The power conditioner shall be a Clary SP400U Universal Power Conditioner. The power conditioner shall be designed for outdoor use, support an operating temperature range of -40°F to +165°F, be operational in humidity levels of 0% to 95% (non-condensing) and operate at an altitude ranging from sea level to two miles above sea level. It shall utilize an input voltage of 120 VAC, 40 to 70 Hz and an output voltage of 120 VAC (± 3%), user selectable 50 to 60 Hz (± 0.25%). The power conditioner shall support a maximum output of 1400W at 120 V. It shall have a total harmonic distortion not exceeding 3.0%. The power conditioner shall utilize input and output electrical connectors conforming to the IEC 60320-1 *Appliance Couplers for Household and Similar General Purposes* specification. Its dimensions shall not exceed 1.7 inches (h) × 11 inches (w) × 8.5 inches depth and its weight shall not exceed 5 lbs. One power conditioner shall be provided with each Cabinet.

Six Outlet Power Strip (Front Side). An integral component of the power conditioner shall be a factory-installed power strip. The power strip shall have six front facing NEMA Type 5-20R outlets. The power strip shall be rated for 20 A at 120 VAC. It shall have an energy rating of 630 Joules, clamping voltage of 500 V and EMI/RFI noise filter of 150 KHz to 100 MHz at up to 43 dB. The power strip shall have a recessed power switch and a power cord of not less than 2.5 feet. The dimensions of the power strip shall be 10 inches (L) × 1.63 inches (W).

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COMMUNICATIONS CABINET (TYPE 2)

DIN Rails (Front Side). Each Cabinet shall utilize standard 1.38 inch DIN rails. The DIN rails shall be of steel construction with a coating for corrosion resistance. The DIN rails shall utilize 0.25 inch × 0.71 inch slots for fastening to the back panel located in each Cabinet. The spacing of the DIN rail slots shall be 0.98 inch center-to-center. DIN rails and associated mounting hardware for attachment to the back panel shall be provided with each Cabinet.

Load Center. Each load center shall be readily accessible and installed on the exterior of the Cabinet close to the door on the back side positioned not more than 6 feet 7 inches above the ground or as required per Article 240.24 of the NEC. The load center shall provide a main and a minimum of four (4) branch circuits. The neutral and ground bars shall be tied together in the load center. The ground bar shall be connected to the service disconnect using a bonding strap.

The ground bar shall be connected to a grounding electrode using grounding conductors conforming to the requirements of Article 250.122 of the NEC. The grounding electrode shall conform to the requirements of Articles 250.52 through 250.70 of the NEC. The load center shall feed a duplex NEMA 5-15R mounted on the inside of the Cabinet.

Foundation. Each Communication Cabinet (Type 2) that is to be ground-mounted shall include a polymer concrete or poured concrete pad that extends at least 2.5 feet beyond the Cabinet base on each Cabinet door side and at least 6 inches beyond the Cabinet base on the other two sides. The Cabinet base shall be sealed around the conduits. There shall also be an 18 inch high aluminum riser. The bottom of this riser shall be solidly connected to the pad. The riser shall be approximately 2 feet above the pad and shall include connection mechanisms to which the Cabinet can be attached.

CONSTRUCTION REQUIREMENTS

Each Cabinet shall have tapped pads to provide for the mounting of a back panel as specified herein.

The Cabinet backplane shall be adjusted in depth to allow mounting of a 10 inch deep Ethernet switch on the front side rack rails.

Mounting of equipment and hardware onto the back panel shall be through the use of self-tapping screws or Velcro Extreme as required per the Plans. Self-tapping screws shall be of appropriate size for the equipment or hardware being installed onto the back panel. The length of the self-tapping screw shall not exceed a ½ inch and the bit recess in the screw head shall be hexagonal.

The power conditioner shall be mounted to the back plane on the back side of the Cabinet such that cooling vents remain unobstructed. The power strip shall be mounted on the back panel on the front side of the Cabinet.

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COMMUNICATIONS CABINET (TYPE 2)

DIN rail shall be mounted to the back panel on the front of the Cabinet to allow for current and future equipment.

Conduit accesses into the Cabinet for electrical wiring, specific field device low-voltage control cabling, and fiber optic cabling, shall be plugged with a manual plug (no foam sealant is allowed). After installation, the top of the Cabinet should be approximately 5 feet above the prevailing ground line.

Cable management and strain relief shall be employed within the Cabinet. Cables shall be labeled and neatly organized using cable ties and/or Velcro. Velcro shall be used on fiber optic jumper cables or bundles of cables containing fiber optic jumper cables. Unused spaces within the back panel and interior wall of the Cabinet may be used to facilitate cable management, but installation of cable management hardware that penetrate the exterior walls of the Cabinet shall not be permitted.

See project specific Testing & Integration Plan for additional requirements.

REVISION OF SECTION 614
LANE CONTROLLER CABINET

Section 614 of the Standard specifications is hereby revised for this Project as follows:

DESCRIPTION

Lane Controller Cabinet shall be furnished and installed at designated Toll Point locations to house and protect ETC components.

The Lane controller cabinet shall be a Type M Stretch Cabinet furnished for designated tolling field device sites to house and protect tolling equipment, communications equipment and power connections. The tolling equipment will be provided by others.

MATERIALS

The nominal dimensions shall be as shown in Table 1 below, but the final dimensions shall be coordinated with the Toll System Integrator prior to ordering.

Table 1 - Communications Cabinet Types

Cabinet Type	Nominal Dimensions
Lane Controller Cabinet	68” (H) × 31” (W) × 19” (D)

Each Cabinet shall be UL 508A *Industrial Control Panels* listed and conform to a NEMA Type 3R rating. The Cabinets shall be H-32 aluminum conforming to the requirements of ASTM B209 *Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate*.

All bolts, clamps, fasteners, hinges, latches, nuts and screws shall be stainless steel, unless an alternative corrosion proof material has been Approved by the Department and is in writing.

A Cabinet grounding stud shall be provided in the vicinity of the ground bus mounted on the back panel.

All fabricated materials and added components must be free from burrs and sharp edges. Exterior seams of the Cabinet shall be continuously welded with edges ground smooth to a 0.03 inch radius. All welding shall be done with gas tungsten arc welds that comply with AWS B2.1- 22-015 *Standard Welding Procedure Specification for Gas Tungsten Arc Welding of Aluminum* and C5.6 *Recommended Practices for Gas Metal Arc Welding*. All welds shall be neatly formed and free of blisters, blowholes, cracks and other irregularities. All bolts, clamps, fasteners, hinges, latches, nuts and screws shall be stainless steel, unless an alternative corrosion proof material has been Approved by the Department and is in writing.

The Cabinet door opening shall be designed to prevent dust and moisture intrusion in conformance to NEMA 3R requirements. All flange joints shall be welded or continuously formed. The door shall have an adequately sized, oil-resistant gasket that provides a uniform seal with the door frame surface in conformance with NEMA 3R requirements and shall be permanently bonded to the door. The door shall utilize a continuous stainless steel hinge that allow for door removal from the hinge side. Hinges shall be mounted such that the Cabinet door opens out to the left, unless otherwise specified by the Department. Hinges shall be mounted with appropriately sized stainless steel hardware. The door shall be equipped with a hasp and staple for padlocking and a Corbin #2 key lock without impacting the NEMA 3R rating. A document holder constructed of high-impact thermoplastic shall be provided for each lane controller Cabinet and permanently mounted to the inside of the door. The Contractor shall insert a copy of the

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REVISION OF SECTION 614
LANE CONTROLLER CABINET

lane controller Cabinet Bill of Materials (BOM), individual Cabinet component specification sheets and an as-built electrical/low-voltage wiring diagram for the Cabinet in the document holder.

Each Cabinet shall have tapped pads to provide for the mounting of a back and side panels as specified herein.

Back and Side Panels. Back and side panels shall be constructed of 0.10 inch Type 5052-H32 aluminum alloy, unless otherwise specified by the Department. The back panel dimensions shall be approximately 25" W x 54" H, and shall be offset from the back of the Cabinet with enough air space to allow for mounting screws to be used without penetrating the external Cabinet shell. Proposed side panel dimensions shall be submitted to the Department for review based on the selected manufacturer's actual Cabinet dimensions. Panels shall mount on fixed bolts inside the Cabinet. All associated mounting hardware for the back and side panels shall be included with each communications Cabinet and be rated for use in NEMA 3R Cabinets.

A DIN rail shall be provided with each Cabinet.

Internal Cabinet Lighting. Provide a minimum of 2 light-emitting diode (LED) light strips per door opening to provide illumination for the entire Cabinet interior. Each door opening shall also be equipped with a door switch to activate the Cabinet lighting. LED light strips and door switches shall be mounted such that they do not interfere with use of rack space or other devices in the Cabinet and shall be easily removable for replacement.

Ventilation. Provide 2 independently wired, 100 CFM exhaust fans near the top of the Cabinet that are controlled by independent adjustable thermostats. Provide filtered air intake ports with removable and replaceable filter on the bottom third of each access door.

Grounding Bus Bar. Equipment ground bus bars shall be provided for each Cabinet. Bus bars shall be UL listed and be fabricated from solid, 110 alloy copper. Each bus bar shall accommodate a minimum of 7 lug positions. The equipment grounding bus bar shall provide an additional 25 percent lug position capacity over the amount of terminations utilized for the Project. Multiple bus bars may be used within each Cabinet, if the interior dimensions of the Cabinet do not allow for the use of a larger bus bar. Each bus bar shall include insulators, stand-off brackets, snap on covers, and stainless steel mounting hardware.

Insulation. Provide R-4 insulation on interior, sides, top and all doors.

Circuit Breakers. An appropriately sized terminal block for accepting the power feed wires from the toll point UPS and 3 circuit breakers (two 20 amp branch circuits and one 40 amp main) shall be provided with the Cabinet. The breakers shall be DIN rail mountable.

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REVISION OF SECTION 614
LANE CONTROLLER CABINET

Cabinet Riser. A minimum 12 inch high riser is required for the tolling point Cabinets. The riser shall be constructed from the same material as the cabinet and shall include a connection mechanism to which the cabinet can be attached. The bottom of the riser shall be solidly connected to the pad.

Foundation. Each Cabinet shall include a polymer concrete or poured concrete pad that extends at least 2.5 feet beyond the cabinet base on each cabinet door side and at least 6 inches beyond the cabinet base on the other 2 sides. The conduit around the Cabinet base shall be sealed.

CONSTRUCTION REQUIREMENTS

Each Cabinet shall have tapped pads to provide for the mounting of a back panel as specified herein.

Conduit accesses into all Cabinets for electrical wiring, specific field device low-voltage control cabling, waveguides and fiber optic cabling, shall be plugged with a manual plug (no foam sealant is allowed).

Conduit accesses into the Cabinet for electrical wiring, specific field device low-voltage control cabling, and fiber optic cabling, shall be plugged with a manual plug (no foam sealant is allowed).

Cable management and strain relief shall be employed within the communications Cabinet. Cables shall be labeled and neatly organized using cable ties and/or velcro. Velcro shall be used on fiber optic jumper cables or bundles of cables containing fiber optic jumper cables.

See project specific Testing & Integration Plan for additional requirements.

REVISION OF SECTION 614
MICROWAVE VEHICLE RADAR DETECTOR (NON 334)
This specification is to be used for all NON 334 cabinet sites.

Section 614 of the Standard Specifications is hereby revised for this Project to include the following:

DESCRIPTION

This work shall consist of furnishing, installing, and configuring a microwave vehicle radar detector (MVRD) in accordance with these Special Provisions at the locations without ground mounted 334 cabinets. Contractor shall order the Wavetronix SmartSensor HD, configuration software, mounting hardware, and compatible Click! DIN rail mountable components.

MATERIALS

The Microwave Vehicle Radar Detector shall include: the radar detection unit with mounting hardware, manufacturer configuration software, power/communication cable, detection unit power supply, serial surge suppression, serial to Internet Protocol (IP) converter, and any additional hardware necessary for a complete and functional installation.

The radar detection unit shall be a Wavetronix SmartSensor HD, model number 101-0415 meeting the following requirements:

The radar detection unit shall include a non-intrusive device using frequency modulated continuous wave radar technology for the gathering of vehicle information including traffic volume, lane occupancy, individual and average speed, vehicle classification, and presence. It shall have auto configuration capabilities to simultaneously identify up to twelve highway lanes with the ability to detect over center median barriers and accurately detect partially occluded vehicles. Weather shall not impact the radar detection of the unit. Wind or temperature change shall not cause the device's original field installation configuration to alter over time. The radar detection unit shall include necessary hardware for pole mounting.

Manufacturer configuration software shall be the latest production version and allow for device discovery, configuration, and troubleshooting.

The power/communication cable shall be the manufacturer's recommended cable for functional operation of the radar detection unit.

A WX-CLK-301 module shall be furnished and installed, along with any cabling, to convert communications from Serial to Ethernet.

The detection unit power supply shall be Wavetronix WX-CLK-201 DIN mountable hardened AC to DC supply meeting manufacturer's recommendations for functional operation. Power supplies are not required when installed at ITS cabinets with existing 12VDC power supplies.

Serial surge suppressor shall be Wavetronix Click WX-CLK-200. The surge suppressor shall be DIN rail mountable with hot swappable protected busses. The surge suppressor shall provide protection for RS-232, RS-485, and DC power to the radar detection unit. Wiring for the surge suppressor shall be by means of pluggable screw terminals and include unprotected RS-232 and RS-485 communications connectors. The surge suppressor shall have a minimum operating temperature range of -29 to 165˚F up to 95 percent relative humidity.

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REVISION OF SECTION 614
MICROWAVE VEHICLE RADAR DETECTOR (NON 334)

The serial to IP converter shall be an externally powered, hardened, 35 millimeter DIN mountable unit, with one RJ-45 port for connection to an Ethernet network, one screw terminal port for connection to a serial device, and one DB-9M pass through port for local communication. It shall operate in a minimum temperature range of -30 to 165°F at 0 to 90 percent non-condensing humidity. The converter shall be powered externally and run off of 9 to 30 VDC drawing a maximum of 6 watts.

It shall support RS-232, 422, and 485 serial protocols at data rates from 300 to 230 kilobits per second, with hardware and software support for request to send (RTS), clear to send (CTS), data terminal ready (DTR), data set ready (DSR), and data carrier detect (DCD) signal control lines and modem emulation. Power, Ethernet, serial signals, and diagnostic status shall be visible via individual built in light emitting diodes (LEDs).

The converter shall be capable of a 10/100 megabit per second full duplex Ethernet connection. Serial ports shall be accessible via transmission control protocol/IP (TCP/IP), user datagram protocol/IP (UDP/IP), and include software drivers for mapping the ports to Windows, Linux, and Unix operating systems using a secure encrypted connection. It shall be configurable via command line interface through the serial port and integrated web interface via Ethernet connection. It shall be capable of serial bridging across an Ethernet network when two units are used together.

The converter shall support the following protocols: http/https, SNMP, TCP & UDP/IP, ASCII, DHCP, ARP, telnet, reverse telnet, PPP, SSH, SSL/TLS, and AES. The converter shall satisfy underwriters laboratories (UL) 1950, ANSI/ISA 12.12.01-2000 – Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations, and Federal Communications Commission (FCC) part 15 (Class A).

The converter power supply shall be designed for a minimum operating temperature range of -13°F to +158°F at humidity levels of 20 to 95 percent (non-condensing), be DIN rail mountable and meet all manufacturer recommendations. The power supply will not be required at Type 1 and Type 2 communications cabinets where a 12 VDC power supply is provided with the cabinet and there is enough capacity on the supply to power all designated 12 VDC equipment at 80 percent loading.

Additional hardware, including but not limited to the following shall be supplied by the Contractor: mounting hardware, data interconnection cables, and power cables.

CONSTRUCTION REQUIREMENTS

The radar detection unit shall be mounted with 0.75 inch Type 201 stainless steel strap and buckles at a height and angle determined by roadway off-set and detection distance in accordance with manufacturer's recommendations.

The power/communication cable shall run from the radar detection unit through the mounting structure to the communications cabinet. A hole not to exceed 1.5 inches shall be made to allow passage of the power/communications cable into the structure. The hole shall not be made below the centerline of the sensor mount, or more than 2 feet above the centerline of the sensor mount. The Contractor shall ensure strain relief and drip loops in the power/communication cable before the cable enters the structure in accordance with manufacture's recommendations, and shall seal the hole with duct seal. Flexible conduit shall be used to run cables from the structure to the communications cabinet. A hole not to exceed 1.5

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MICROWAVE VEHICLE RADAR DETECTOR (NON 334)

inches shall be made below the communications cabinet to allow the power cable and communications cable to pass from the interior of the structure to the interior of the communications cabinet.

All holes shall be free of burs and sharp edges prior to the installation of all cable, conduit, and conduit nipples. All cable entrances in structures, conduits, and cabinets shall be sealed and waterproofed. All wiring and electrical connections shall be performed in conformance with the latest version of the NEC.

The serial surge suppressor shall be installed on DIN rail inside the communication cabinet. The power/communications cable shall be terminated on the protected side of the WX-SC-200 surge suppression unit per manufacturer's recommendations. The radar detection unit shall be wired to support RS-232 and RS-485 serial communications. Power shall be wired to the manufacturer's recommended power supply or the existing 12VDC power supply supplied in the communications cabinet. Wiring from the surge suppressor to the communication device shall be stranded Cat5 cable.

The serial to IP converter shall be installed on DIN rail inside the communication cabinet and powered from the manufacturer's approved power supply. When installed in a Type 1 or Type 2 communications cabinet, the 12 VDC power supply provided with the cabinet shall be used instead to power the converter as long as the final total load on the supply is less than 80 percent of total capacity.

The network connection from the converter to the field communication equipment shall be made with Cat5e cable using 8P8C terminations. The cable shall be long enough to connect from the field communication equipment directly to the serial device being converted to allow for future upgrade of the device to direct Ethernet communications.

The serial connection from the converter to the serial surge protector shall be made with stranded Cat5e cable. All bare wire connections shall be cleanly terminated with no stray or loose wires.

The network connection from the converter to the field communication equipment shall be made with Cat5e cable using 8P8C terminations.

The Contractor shall configure the converter with IP addresses as shown on the Plans or provided by the Engineer. Serial communication setting shall also be configured to match the serial device.

For a MVRD the settings are typically: 9600 bits per second, 8N1, no flow control; with TCP connections enabled to the serial port.

The Contractor shall utilize the latest version of manufacturer's software to verify optimal and correct sensor alignment to the roadway and configure the sensor. The Contractor shall configure the radar detection unit to detect all lanes per Plan sheets or the Department's direction and in accordance with the manufacture's recommendations. The Contractor shall configure the sensor for the following:

(1) Sensor Settings

A) General tab

1. Subnet/ID=000/Sensor ID per Plans

2. Location= HWY Installed Direction Mile Post and Common Name

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MICROWAVE VEHICLE RADAR DETECTOR (NON 334)

3. Orientation = Direction the unit is pointing

4. Date& Time = Synchronize to this computer

B) Ports tab

1. Comm: RS-232

2. Baud Rate=9600 bits per second

C) Outputs tab

1. Legacy Protocols

(a) SS105 Protocol = Off

(b) RTMS protocol = Off

(2) Lane Setup

A) Sensor Alignment: Shall show green, unless detected lanes are not parallel.

B) Lane configuration = Setup using auto-configuration and manually adjust as necessary to detect lanes

(3) Data Setup and Collection

A) Interval Data: Interval=30 seconds

B) Data Push = OFF for output to RS-232 port

Once the device has been configured the Contractor shall verify connectivity through the serial to IP converter to the device, and connect the serial or Ethernet connection to the field communication device as appropriate. Once network connectivity has been verified, the Contractor shall confirm that the device is accessible and fully functional from the centralized software system at the CTMC.

See project specific Testing & Integration Plan for additional requirements for MVRDs.

REVISION OF SECTION 614
WIRELESS MODEM

Section 614 of the Standard Specifications is hereby revised for this Project as follows:

DESCRIPTION

This work consists of furnishing and installing a cellular wireless data modem at field devices for temporary communication. The modem is intended to establish remote communications to serial or Ethernet devices via a public carrier network. Communications to the modem may do by public internet, or private CDOT access; and will be determined by the Project or device. At this time CDOT uses Verizon wireless as their service provider.

For this Project the modem is intended to provide temporary communication to TTI, SFR, and/or VMS devices while work is performed to change the hardwired fiber network connection.

MATERIALS

The wireless modem shall include a cellular wireless data modem, associated power supply, cellular antenna, antenna cable, communication cable, and any necessary mounting hardware. All materials shall be furnished and installed by the Contractor.

The cellular wireless data modem shall be a standalone hardened unit designed to communicate to serial and Ethernet devices over 4G LTE and 3G wireless network. The modem shall consist of a unit capable of transmitting data by its embedded operating system and its own TCP/IP stack to enable transmission of data from non-IP devices. The Wireless Modem shall meet the following minimum requirements:

(1) Communication to Ethernet devices via three 10/100 RJ-45 Ethernet jack.

(2) Communications to RS-232 serial devices via DB-9F connector at speeds from 300 to 230,400 bps.

(3) Support TCP/IP, UDP/IP, DHCP, HTTP, SNMP, SMTP, DNS, NAT, PPPoE, VLAN, port forwarding,SMS, MSCI, NMEA, TAIP , and GPS protocols.

(4) Visual light indicators that show unit status for power, cellular signal, network connection, and data activity.

(5) Cellular network support for 4G LTE at 700MHz and CDMA EV-DO rev A, 1x EV-DO rev 0, or 1xRTT at 800/1900 MHz with options for MIMO in LTE mode or receive diversity in CDMA mode.

(6) Remotely upgradeable PRL, firmware, and configuration.

(7) Minimum EV-DO rev A data rates of 3.1 Mbps downlink and 1.8 Mbps uplink.

(8) Built in GPS receiver with port for external antenna.

(9) 50 ohm SMA antenna interfaces.

(10) Operate on 9-36 VDC at 0.5 amps or less.

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REVISION OF SECTION 614
WIRELESS MODEM

(11) Operate within a temperature range of -20 to 150˚F at 0 to 95% humidity.

(12) Management platform available from the manufacturer.

The power supply shall output a nominal 12 volts direct current at a minimum of 2 amps to power the wireless cellular data modem. The power supply shall be rated to operate within a temperature range of the modem.

The cellular antenna shall be outdoor rated, omnidirectional, and capable of transmitting and receiving on 3 frequency bands: 700MHz for LTE and 800/1900 MHz for CDMA operation. The antenna shall be base or wall mountable.

The antenna cable shall be an RG-58 coaxial cable type rated at 50 ohms. The cable shall be terminated with a male SMA on one end for connection with the wireless cellular data modem. The other end shall be terminated with the correct connector to interface with the tri band antenna.

The communication cable shall be constructed from twisted pair cable with minimum 22 gauge stranded conductors. For Ethernet communication the cable shall be terminated with 8P8C connectors with T568B pin/pair assignments. For serial communication the cable shall be terminated with a DB-9M for interfacing with the wireless cellular data modem. The other end shall be terminated such that it will mate with the designated end equipment.

CONSTRUCTION

The wireless cellular data modem shall be installed in the manor and locations as shown on the plans. A complete installation consists of the wireless cellular data modem, power supply, dual band antenna, antenna cable, communication cable, and wiring power to the unit. The Contractor shall install the power supply to the wireless cellular modem per manufacturer's recommendations. The Contractor shall connect the wireless cellular modem to the designated end equipment as specified in the plans. The placement of the unit shall allow provision for cable installation and maintenance per manufacturer's recommendations. All electrical wiring and connections shall meet NEC standards. The Contractor is responsible for supplying all necessary cabling, connectors, and hardware to make the installation functional.

The Contractor shall provide CDOT ITS with the device ID and login credentials so that CDOT staff can add the device to the network.

The Contractor shall be responsible for the cellular bill and payment during construction

REVISION OF SECTION 614
SERIAL TO IP CONVERTER

Section 614 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

This work consists of furnishing and installing a serial-to- IP converter at field devices. The serial to IP converter is intended to convert serial communication data to IP for access from an Ethernet communication network.

MATERIALS

The serial to IP converter shall include the converter, power supply, Cat5e cable, and any mounting hardware, cabling, and terminations required for a fully functional installation.

Converter. The type of serial to IP converter used will vary depending on the communication requirements of the end device and corresponding control software. Converter A is required for use with a Microwave Vehicle Radar Detector (MVRD), Diamond Counter for DTD ATR stations, or Traffic Signal (TS).

The converter shall be an externally powered, hardened, 35mm DIN mountable unit, with one (1) RJ-45 port for connection to an Ethernet network, one (1) screw terminal port for connection to a serial device, and one (1) DB-9M pass through port for local communication. It shall operate in a minimum temperature range of -30 to 165°F at 0-90% non-condensing humidity. The converter shall be powered externally and run off of 9-30 V DC drawing a maximum of 6W. It shall support RS-232, 422, or 485 serial protocols at data rates from 300 to 230kbps, with hardware and software support for RTS, CTS, DTR, DSR, and DCD signal control lines and modem emulation. Power, Ethernet, serial signals, and diagnostic status shall be visible via individual built in LEDs.

The converter shall be capable of a 10/100Mbps full duplex Ethernet connection. Serial ports shall be accessible via TCP/IP, UDP/IP, and include software drivers for mapping the ports to Windows, Linux, and Unix operating systems using a secure encrypted connection. It shall be configurable via command line interface through the serial port and integrated web interface via Ethernet connection. It shall be capable of serial bridging across an Ethernet network when two units are used together.

The converter shall support the following protocols: http/https, SNMP, TCP & UDP/IP, ASCII, DHCP, ARP, telnet, reverse telnet, PPP, SSH, SSL/TLS, and AES. The converter shall satisfy UL1950, UL 1604 (Class1, Division 4), and FCC part 15 (Class A), and IEC 1004-2.

Power Supply. The power supply shall output 12 VDC and support an input voltage range of 85-264 VAC and frequency range of 47-63 Hz. It shall have a typical efficiency of at least 76 percent and typical AC current of 1.6 A at 115 VAC. The 12 VDC power supply shall provide an output voltage of 12 VDC and have a minimum current rating of 6.3 A. It shall support an output current range of 0 to 6.3A (minimum) and have a rated power of 75 W (minimum). It shall have overload protection of 105-150% for its rated output power and overvoltage protection for voltages of 15-16.5 VDC. It shall be designed for a minimum operating temperature range of +14°F to +140°F at humidity levels of 20 to 90 percent (non-condensing). The 12 VDC power supply shall conform to the following standards: IEC 60068-2-6 Environmental Testing (Vibration) and UL 508 Industrial Control Equipment. It shall be DIN rail mountable, have dimensions not exceeding 5 inches (H) by 2.25 inches (W) by 4 inches (D) and a weight of not more than 1.5 pounds. A 12 AWG AC power cord with NEMA 5-15P shall be included with the power supply.

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REVISION OF SECTION 614
SERIAL TO IP CONVERTER

The power supply will not be required at Type 1 or Type 2 ITS cabinets where a 12 VDC power supply is provided with the cabinet and there is enough capacity on the supply to power all designated 12VDC equipment at 80% loading.

Cat 5e cable. Cable shall be an 8 wire twisted pair cable constructed of 24 AWG stranded copper wires with minimum Category 5e rating. The outer jacket shall be UV resistant PVC insulation designed for outdoor use. Shielded cable shall be used when prescribed by the manufacturer, run through conduit or enclosed structures, and when needed for equipment or electrostatic grounding. Shielded cable shall be terminated with either conductive or non-conductive male 8P8C connectors. Where shielded cable is used as an equipment ground, conductive connectors shall be used on both ends of the cable. Where shielded cable is used as an electrostatic drain, the grounded side of the connection shall be terminated with a conductive connector and the ungrounded side shall be terminated with a non-conductive connector. Unshielded cable shall be used for interconnections within the same cabinet, or where grounding and electromagnetic interference is not present. Unshielded cable shall be terminated with non-conductive male 8P8C connectors on both ends. All Cat 5e cables used for Ethernet data shall conform to the Telecommunications Industry Association (TIA)-568 *Commercial Building Telecommunications Cabling Standard* and utilize the T568B pin/pair assignments.

CONSTRUCTION REQUIREMENTS

When installed in a Type1 or Type 2 ITS cabinet, the serial to IP converter shall be mounted on DIN rail. The 12 VDC power supply provided with the cabinet shall be used to power the converter as long as the final total load on the supply is less than 80% of total capacity. If an additional power supply is needed to power the converter, it shall be mounted on the DIN rail and plugged into a UPS protected outlet if available.

When installed in a ground cabinet for a TS, the converter and power supply shall be mounted on DIN rail fastened to the 19 inch cabinet rack rail. The power supply for the converter shall be plugged into a UPS protected, non-GFCI outlet designated for electronic loads.

Stranded 16 AWG copper wires with red and black insulation should be used to wire DC power from the power supply to the converter.

The network connection from the converter to the field communication equipment shall be made with Cat5e cable using 8P8C terminations. The cable shall be long enough to connect from the field communication equipment directly to the serial device being converted and allow for future upgrade of the device to direct Ethernet communications.

The serial connection from the converter to the serial device shall be made with Cat5e cable using the termination compatible with the serial device. The Contractor shall consult with the serial device manufacturer for correct terminations and wiring. All bare wire connections shall be cleanly terminated with no stray or loose wires.

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SERIAL TO IP CONVERTER

All communication cabling shall be routed cleanly and use cable tie supports every 2 feet. The cables shall be labeled on both ends indicating the device and port of the individual connection. Labels shall be self-laminating vinyl with black lettering on a white background.

The Contractor shall configure the converter with IP addresses as provided by the Engineer. Serial communication setting shall also be configured to match the serial device. In general this is as follows:

- For a MVRD: 9600bps, 8N1, no flow control; with TCP connections enabled to the serial port.
- For a Diamond Counter for DTD ATR Stations: 9600bps, 8N1, no flow control; with TCP connections enabled to the serial port.
- For a TS: 9600bps, 8N1, no flow control; with TCP connections enabled to the serial port.

After installation the Contractor shall verify local network communications directly to the converter and to the serial device. Once local communications has been verified, the Contractor shall confirm that the device is accessible and fully functional from the centralized software system on the CDOT network.

See project specific Testing & Integration Plan for additional requirements.

REVISION OF SECTION 614
FIBER OPTIC PRE-CONNECTORIZED CABLE

Section 614 of the Standard Specifications is hereby revised for this Project to include the following:

DESCRIPTION

This work consists of the installation of fiber optic pre-connectorized patch cables in communication cabinets and communication node buildings from the termination patch panel to the optical communication device optics.

MATERIALS

The measured attenuation of the connector (inclusive of coupler and mated test connector) shall not exceed an average of 0.3 dB for all connectors provided. Any connector found in excess of 0.5 dB shall be rejected. Reflectance shall be less than -40 dB from 14º F to 140º F (-10ºC to +60ºC). The manufacturer shall have a program that periodically tests connectors to ensure that after 1000 re-matings, the attenuation will not change more than 0.2 dB.

The measured insertion loss shall be a maximum of 0.25 dB with a typical loss of 0.15dB. Return loss shall be a maximum of -65 dB (APC) and -55 dB (UPC) with a typical loss of -68 dB (APC) and -58 dB (UPC). The minimum cable bend radius shall be less the 15 mm.

The connector shall be able to withstand an axial pull of 25 lbs. with no physical damage to the connector and no permanent optical degradation more than 0.3 dB.

The pre-connectorized cables shall be provided with pre-connectorized connectors on both ends to match the termination patch panel bulkheads and small form-factor pluggable optic modules of the Ethernet switch. Connectors shall be terminated by the manufacturer.

The connectors shall be nickel-plated with a ceramic ferrule and shall be polished with a physical contact (PC) finish end to reduce reflection.

The cables shall contain the exact number of loose tube fibers and bulkhead connectors to connect from the termination patch panel to the optical modules. If the optical equipment transmits and receives data with a single optic, the pre-connectorized cable shall contain a single optical fiber (simplex). When the optical device transmits and receives data with two or four optics, or a network Ethernet switch small form factor pluggable optic module, a pre-connectorized cable shall be provided with two (2) optical fibers (duplex) per pair of transmit and receive optics.

CONSTRUCTION REQUIREMENTS

Pre-connectorized cables shall be installed from the termination panel bulkheads to the optical modules of the communication devices.

At the communications node building, the pre-connectorized cables shall be installed in the cable management hardware attached to equipment racks. The Contractor shall provide patch cables of sufficient length to span from the fiber termination patch panel bulkheads to the communications device or network device optical port. This length shall include a maximum of four (4) feet of slack cable. Appropriate cable management shall be used.

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REVISION OF SECTION 614
FIBER OPTIC PRE-CONNECTORIZED CABLE

At communication cabinets, the Contractor shall provide pre-connectorized cables of sufficient length to span from the fiber termination patch panel bulkheads to the equipment device or network device optical port. This length shall include a maximum of two (2) feet of slack cable. Appropriate cable management shall be used.

Prior to installation, all pre-connectorized cable bulkhead connectors shall be cleaned with lint-free fiber wipes moistened with Isopropyl Alcohol 99% U.S.P. After cleaning with alcohol, the bulkhead shall be cleaned with an optical connector cleaner to ensure that all residue is removed.

Manufacturer testing reports for pre-connectorized cables shall be submitted as part of the as-built documentation. The installation location shall be noted on the test report for future reference.

At communication node buildings, pre-connectorized patch cables shall have identification labels applied on each end. Information indicating the patch panel number, device being connected and Ethernet switch port. CDOT personnel will aid in the labeling as it pertains to the proper nomenclature to be provided and/or Ethernet port connections.

At all field device locations, each cable shall have individual labels indicating the termination panel port and the data transmitting description (example: Tx or Rx).

The pre-connectorized cables shall be provided in the following lengths.

Field Device Cabinets ..... 4 Feet, 0 Inch maximum

Node Buildings ..... Cable shall be of sufficient length to accommodate connection of termination patch panel bulkhead to each individual optical device while allowing for 4 feet of slack.

REVISION OF SECTION 614
FIBER OPTIC SPLICE CLOSURE

Section 614 of the Standard Specifications is hereby revised for this Project to include the following:

DESCRIPTION

This item includes installing fiber optic splice closures and performing splicing of both fiber optic backbone and fiber optic lateral cables at locations shown on the plans.

When the project network is designed utilizing Coarse Wavelength Division Multiplexing (CWDM) network equipment, the Contractor shall provide two splice closures. Both closures shall be of the same size and shall be sized to accept both the backbone fiber optic cable and the associated fiber optic lateral cable(s).

The CWDM splicing design shall include one splice closure utilized for splicing of the backbone fiber optic cable to the lateral fiber optic cable(s) and filters. The second splice closure will be used for splicing the lateral fiber optic cable(s) to the coarse wavelength division multiplexing single wavelength filters and the lateral fiber optic cable(s) extending to the device communications cabinet or variable message sign.

The Contractor shall also be required to perform an audit of existing fiber optic splice closures to confirm current connectivity information prior to splicing field devices.

MATERIALS

The fiber optic splice closures shall be furnished and installed by the Contractor.

The splice closures shall be dome type and shall meet the following minimum requirements:

(1) The closures shall seal, anchor and protect fiber optic cable splices.

(2) The closures shall have a minimum of six total cable entries.

(3) The closures shall be suitable for underground applications and shall be corrosion resistant, watertight and airtight.

(4) The closure splice trays shall have a hinged design with an upright locking mechanism for all splice trays.

(5) The closures shall have a sealing design that does not require glue, sealant, or new cable seals to re-enter the closure.

(6) The closure shall be bonded inside and outside and have an external ground lug.

(7) The Contractor shall include all necessary accessories to complete splicing.

(8) The Contractor shall include all mounting hardware

(9) The splice closure shall comply with Telcordia Generic Requirement (GR) GR-771

The closures shall be sized to provide a capacity equal to the total number of strands for all cables entering the closure.

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REVISION OF SECTION 614
FIBER OPTIC SPLICE CLOSURE

The Contractor shall provide the required equipment to perform the audit of existing fiber optic splice closures. This equipment is expected to include, but not be limited to, common hand tools, a standard torque wrench, and a digital camera.

CONSTRUCTION REQUIREMENTS

The Contractor shall notify the Department of proposed daily splicing locations two business days prior to splicing and also the morning of proposed splicing. The Contractor shall contact the Department ITS Engineer at least four hours prior to sealing the closure to allow inspection.

If the Department ITS Engineer cannot be on site to inspect the open splice closure, a minimum of eight digital pictures shall be taken at varying angles of the interior of the splice closure showing all completed work as stated in this specification. The pictures shall include exposed fiber stands (both spliced and uncut) in all splice trays, fiber tray labeling and remaining buffer tubes showing appropriate coiling. One picture shall also include the complete re-assembly of all interior parts prior to final sealing. Once the closure and fiber coils are installed in the pull box or manhole, two pictures shall be taken showing the final installation of both the closure and the coiled fiber cable attached to the fiber management hardware. All pictures shall be organized per location and shall be submitted to the Department along with all final testing result documentation.

All splices shall be performed using the fusion splicing method. The fusion splicer shall be calibrated and certified at least once within the previous year from this Project. The Contractor shall present all certification documentation to the Department prior to start of fiber splicing.

The optical fibers shall be fusion spliced and shall meet the requirements in the Revision of Section 614 – Test Fiber Optic Cable special provision and the project specific Testing & Integration Plan.

The Contractor shall label each individual splice and buffer tube in all splice trays.

All unused buffer tubes and fiber strands shall remain uncut. After the fiber cable and proposed buffer tube is prepped for splicing, all fiber strands in the buffer tube shall be thoroughly cleaned. All uncut fiber strands shall be coiled in the tray. Remaining buffer tubes shall be neatly coiled, secured and stored in the storage area within the closure under the splice trays per the manufacturer's recommendations. Buffer tubes proposed for splicing shall be wrapped and secured to the splice tray with ties per the manufacturer's recommendations.

At CWDM splice locations, the completed splices and coarse wavelength division multiplexing single wavelength filters shall be secured in the splice tray foam splice chips per manufacturer's recommendations. Bare fiber strands shall not be taped to the splice tray.

All fiber optic cables shall be secured and sealed at the closure entrances. All unused cable entries shall be plugged.

If the closure requires re-entry, it shall be conducted per the manufacturer's recommendation for re-entry and resealing. The Contractor shall use caution to prevent damage to the existing fiber strands, splices, CWDM filters, and buffer tubes inside the splice closure. When sealing the closure for a second time, the Contractor shall follow all re-entry requirements of the manufacturer.

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FIBER OPTIC SPLICE CLOSURE

The Contractor shall ensure that the fiber optic splice closures and associated fiber cable coils fit adequately within the manhole or pull box splice locations, and shall securely mount the splice enclosure to the side of the manhole.

As part of ITS audit process for existing fiber optic splice closures, the Contractor shall physically access and open the splice closure and take digital photographs of each splice tray. This shall be supplemented with documenting the backbone and lateral cables entering the splice closure along with the buffer tube and fiber assignment associated with each splice to verify existing field device connectivity. The audit process shall be performed in conjunction with CDOT ITS personnel and/or a designated representative of CDOT ITS to enhance coordination and consultation with the Contractor. To facilitate this activity, the Contractor shall inform the Engineer a minimum of 5 working days prior to initiation of its auditing activities.

See Project specific Testing & Integration Plan for additional requirements.

REVISION OF SECTION 614
AUTOMATIC TRAFFIC RECORDING STATION

Section 614 of the Standard Specifications is hereby revised to include the following:

DESCRIPTION

This work consists of replacing any and all existing Division of Transportation Development (DTD) Automatic Traffic Recording (ATR) Station equipment that is impacted during construction and furnishing and installing a temporary ATR station to be used during construction. This also includes providing a cabinet to house all components for the ATR station.

The Contractor shall furnish and install any in-pavement loops, piezoelectric axle sensors (piezo), conduit and pull boxes for the existing permanent DTD ATR Stations that are impacted during the construction.

The Contractor shall also furnish and install temporary DTD ATR stations which will be used to provide traffic volume and classification information while the permanent ATR stations are out of service. The temporary ATR stations shall be installed and operational prior to any shift in traffic. The temporary ATR stations will be installed on temporary poles as close as practically possible to the existing ATR stations. Each temporary ATR station will consist of a Wavetronix SmartSensor HD126 side-fire radar unit, CDMA cellular modem, pole mounted cabinet, and associated equipment, to make a complete temporary CDOT DTD ATR Station. CDOT DTD will provide 1- 4 lane Phoenix Traffic Counter, 2 cables to interface the counter to the Click 100 and 1 cable to connect the counter to the modem for each temporary ATR station. All equipment for the temporary ATR shall be salvaged to CDOT DTD at the end of the project.

The Contractor shall coordinate all work with Mike DelCupp, Traffic Data Collection Manager, at 303-757-9816.

MATERIALS

1. *Permanent ATR Station.* The permanent ATR Station materials shall include a cabinet, cabinet foundation, counter, loop detector wire, and piezos. The cabinet, cabinet foundation, loop detector wires, and piezos shall meet the following specifications:

    - NEMA Type M cabinet with one outlet, fan, thermostat, 20 amp breaker, and a shelf.
    - Each communications cabinet shall include a polymer concrete or poured concrete pad that extends at least 2’-6” beyond the cabinet base on each cabinet door side and at least 6” beyond the cabinet base on the other two sides. The cabinet base shall be sealed around the conduits.
    - Loop detector wire shall consist of specified loop wire encased in ¼ inch OD, 3/16 inch ID vinyl or polyethylene tubing. (14-1/C Loop detector cable 19 STR. PVC/Nylon/PVC Tube 600v IMSA 51-5)
    - Loops shall be sealed with a two-part self-curing, self-bonding weatherproof epoxy approved for sealing loops. Loops shall be 6 feet by 6 feet.
    - The piezo shall be class II and 6 feet in length. The piezo shall have sufficient lead in cable, so the lead in cable can be pulled into the cabinet without splicing.

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AUTOMATIC TRAFFIC RECORDING STATION

- Grout or epoxy for the installation of the loops and piezos shall conform to manufacturer's recommendations.
- The Phoenix II Diamond traffic counter shall be furnished and installed, along with any cabling and hardware necessary. The counter shall be capable of counting and classifying a minimum of 6 lanes. The Contractor shall provide the number of counters needed such that all lanes are classified.

2. *Temporary ATR Station.* The temporary ATR Station materials shall include:

(a) *Wavetronix SmartSensor HD126 Side-fire Radar Unit*: The radar detection unit with mounting hardware, manufacturer configuration software, power/communication cable, detection unit power supply, serial surge suppression, and any additional hardware necessary for a complete and functional installation. The Contractor shall furnish and install the following required items, which shall all be DIN rail mountable, for the Wavetronix radar detection unit:

- Fuse block,
- Wavetronix Series 100 Click module,
- Mini power supply and circuit breaker,
- Wavetronix Series 205 Click module, and
- Wavetronix Click 200 for the serial surge suppressor.

The surge suppressor shall be DIN rail mountable with hot swappable protected busses. The surge suppressor shall provide protection for RS-232, RS-485, and DC power to the radar detection unit. Wiring for the surge suppressor shall be by means of pluggable screw terminals and include unprotected RS-232 and RS-485 communications connectors. The surge suppressor shall have a minimum operating temperature range of -29 to 165˚F up to 95 percent relative humidity.

Manufacturer configuration software shall be the latest production version and allow for device discovery, configuration, and troubleshooting.

Power/communication cable shall be the manufacturer's recommended cable for functional operation of the radar detection unit.

(b) *CDMA Wireless Modem:* A CDMA cellular modem shall be furnished, installed, configured, and tested, and the Contractor shall establish communications from the DTD central system to the field ATR. The Contractor shall be responsible for the cellular bill and payment during construction.

(c) *Pole Mounted Cabinet*: The pole-mounted cabinet shall be NEMA 4R rated and shall be sized adequately to house all of the ATR Station components, such as the counter, CDMA modem, Wavetronix equipment, power supplies, cabling, and wiring. The cabinet shall be a minimum of 20 inches x 20 inches with a 120 volt outlet.

(d) *Traffic Counter*: The Contractor shall provide a Phoenix Traffic Counter, cables to interface the counter to the Click 100 and any cable to connect the counter to the modem. The Contractor shall contact Mike DelCupp at 303-757-9816 for the equipment supplied by DTD.

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AUTOMATIC TRAFFIC RECORDING STATION

CONSTRUCTION REQUIREMENTS

(a) *General.* A minimum of five days prior to installation, the Contractor shall submit a schedule of installation activities including alternative scheduling to the CDOT Project Manager and the Traffic Data Collection (TDC) Manager (Mike DelCupp, 303-757-9816, mike.delcupp@state.co.us). The installation instructions from the manufacturer shall also be submitted for approval. Installation shall not begin until approval has been received from CDOT.

For the permanent ATR, the Contractor shall install the loops and piezos as close to the existing detection equipment locations as possible. Exact locations, dimensions, and configurations may vary based on site conditions, and shall be as Approved by CDOT.

All work will be inspected by the Traffic Data Collection Unit (TDC) during installation.

The permanent and temporary ATR shall be installed in accordance with these specifications, the project details, and in accordance with manufacturer's recommendations.

(b) *Installation of loops.* Loops shall be centered in the travel lane with two sides parallel to lane striping. The saw cut for the loops shall be made 3/8 inch wide and 3-½ inches deep. The saw slot shall be as straight as possible and shall not vary more than ½ inch when checked with a straightedge. No more than one set of loop lead wires shall be placed in one saw slot. Saw cuts shall be hydro-blasted with a mixture of water and air and then blown free of water and debris with compressed air, using a large capacity air compressor of at least 150 CFM. The cuts shall be dry prior to placement of loop wire.

The Contractor shall locate all buried utilities, which may interfere with the planned location of the ATR site. The Contractor shall contact the Utility Notification Center of Colorado (UNCC) at 811 or 1-800-922-1987 for location of member utilities at least three working days prior to any excavation, not including the day of actual notice.

The Contractor shall also locate non-member utilities, such as storm sewer and ditch. Any utility conflicts encountered with the proposed installation shall be brought to the attention of the Engineer

After the saw slot is cleaned of debris and dried, the wire shall be placed for the loop by pushing it into the slot with a blunt non-metallic object. A screwdriver or other sharp tool will not be permitted. Care shall be used to avoid abrading or damaging the insulation.

All loop corners shall be rounded using a 1-½ inch hole drilled to a minimum depth of 3-½ inches. Loop leads shall be drilled when leaving the roadway surface at a 45 degree angle 8 inches from pavement edge out through the side or bottom of roadway, the drilled hole shall be no larger than ¾ of an inch. All holes shall be spaced a minimum of three inches from one another. No more than one set of loop lead wires shall be placed in one drill hole.

One continuous length of loop wire shall be used for each loop from pull box or cabinet around the loop with 4 turns and back to the pull box or cabinet with no splices. The wires shall be seated in the bottom of the saw slot. A ½-inch backer-rod shall be installed to insure wires do not float to the surface during grouting. Backer-rod shall be installed in 4 to 6 inch pieces with 1 to 2 foot gaps

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in-between, to insure the sealant will come in contact with the loop wire. One continuous piece of backer-rod will not be allowed.

After the loops are properly seated and tested, the slots shall be filled with a two-part self-curing, self-bonding epoxy or grout, as recommended by the manufacturer. Excess epoxy shall be removed to avoid unnecessary high spots, and level with the roadway surface.

Loop leads shall be pulled into cabinet without splices to match original installation when applicable.

All detector loops shall measure six feet by six feet.

Installation at an ATR count or classification site shall consist of one loop or one loop set (two loops) within a single lane. The loop sets shall be separated by 10 feet, plus or minus 1 inch, resulting in a distance of sixteen feet from the leading edge of the first loop in the direction of travel to the leading edge of the second loop.

Loop and loop leads shall be installed directly into the pavement, to pavement edge, pull box or cabinet. If loops are installed during asphalt paving, the loops shall be installed before the final lift is placed.

Loop lead wires from pavement edge to pull box shall be enclosed in ¾ inch PVC conduit or ¾ inch rubber hose to protect wire from abrasion. Loop lead-in pairs from pavement edge, to pull box, shall be symmetrically twisted 5 turns per 1 foot. Pull boxes or cabinet shall contain a minimum of 3 feet of loop lead wire for splicing. All loop and loop leads shall be clearly labeled in all pull boxes and cabinets. The Contractor shall be responsible for all trenching and digging from pavement edge to pull box.

All splices shall be made with approved waterproof pressure connector. All splices shall be capable of satisfactory operation under continuous submersion in water.

(c) Piezo Installation.

The piezo shall be permanently installed by grouting into the roadway flush to 1/16 of an inch above the roadway surface by grouting into a concrete roadway or the final lift of asphalt.

Piezo sensors shall be installed in compliance with the manufacturer's recommendations.

At an ATR axle classification site, one 6 foot piezo sensor per lane shall be installed at the exact midpoint between the two loops and to the right or left side of the line, centered in the wheel path.

The saw cut shall be as straight as possible and shall not vary more than ½ inch when checked with a straightedge. The size of the saw cut shall be to the manufacturer's specifications and not vary more then 1/8 of an inch in width. The slot for the piezo lead wire shall be 3 inches deep and 3/8 of an inch wide. Only one piezo lead wire shall be placed in the saw slot.

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AUTOMATIC TRAFFIC RECORDING STATION

Piezo lead shall be drilled when leaving the roadway surface at a 45 degree angle 8 inches from the pavement edge out through the side or bottom of the roadway, the drilled hole shall be no larger than ¾ of an inch. All holes shall be spaced a minimum of 3 inches from one another. No more than one piezo lead wire shall be placed in one drill hole.

Saw cuts shall be hydro-blasted with a mixture of water and air and then blown free of water and debris with compressed air, using a large capacity air compressor of at least 150 cubic feet per minute. The cuts shall be dry and cleaned with acetone prior to placement of the piezo.

The piezo shall not be installed if roadway surface temperature is not above the manufacturer's recommended minimum temperature, or cannot be maintained above this temperature for a minimum of two hours after installation. The piezo shall not be installed if roadway surface temperature is above the manufacturer's highest recommended temperature for grout installation.

The piezo lead wire shall be placed in the saw slot with a blunt non-metallic object. A ½ inch backer-rod shall be installed to insure the wire does not float to the surface during grouting. The backer-rod shall be installed in 4 to 6 inch pieces with 1 to 2 foot gaps in between, to insure the sealant will come in contact with the piezo lead wire. One continuous piece of backer-rod will not be allowed.

The sealant for the piezo lead wire shall be the same as that used for loops.

Piezo lead wire shall be pulled into the cabinet without splices, unless the length exceeds 300 feet.

Only one lead wire shall be placed in a saw slot.

Piezo lead wires from pavement edge to pull box shall be enclosed in ¾ inch PVC conduit or ¾ inch rubber hose, to protect wire from abrasion. Pull boxes or cabinet shall contain a minimum of three feet of piezo lead wire for splicing. Lead wire shall be clearly labeled as Approved by the Engineer and the TDC.

All splices in piezo wiring shall be soldered and enclosed in a resin filled splice kit.

(d) *Pull Boxes*. All pull boxes on the shoulder of the roadway surface shall be raised to finished grade or level with the surrounding ground. If the shoulder has been raised to the point that the conduit is below the bottom of the pull box, then the conduit shall be raised. All wiring splices for existing wiring shall be a minimum of 12 inches in length above the conduit.

All existing pull boxes that are found to be damaged shall be replaced.

(e) *Water Valves.* A minimum of two feet of slack shall be provided on the loop and piezo wires that are contained in water valves.

No splices shall be allowed in water valves.

(f) *Pull Rope.* A 1/8 inch nylon pull rope shall be installed in all new conduits and all existing conduits where a wire or cable is added or an existing wire or cable is replaced.

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AUTOMATIC TRAFFIC RECORDING STATION

(g) *Conduit*. The contractor shall seal all conduits with a sealing compound where a wire or cable is added or an existing wire or cable is replaced. The sealing compound shall be UL tested and approved for use. Sealing compound shall be a permanently soft, fibrous, non-staining sealer that can be easily applied and removed by hand at all working temperatures. Sealing compound shall be designed to seal out weather, moisture, dust rodents, and atmospheric conditions both indoors and outdoors. No foam sealant will be allowed.

(h) *Telephone Drop/ Fiber Connection*. The contractor shall provide a telephone drop/connection to the permanent ATR cabinet for connection to DTD and shall also provide a fiber connection.

See project specific Testing & Integration Plan for additional requirements for DTD ATR's.

REVISION OF SECTION 614
FIBER OPTIC CABLE (SINGLE MODE)

Section 614 of the Standard Specifications is hereby revised for this Project to include the following:

DESCRIPTION

This work consists of furnishing and installing backbone and lateral single mode fiber optic cables.

MATERIALS

All fiber optic cables shall be suitable for outdoor conduit installation.

All fiber optic cable shall have compatible characteristics with other proposed and existing fiber optic cables. All optical cables furnished on this Project shall meet the following fiber optic industry standards:

(1) International Telecommunications Union – Telecommunications Standardization Sector - Recommendation G.652.D
(2) Telecommunications Industry Association (TIA) - 598-D Optical Fiber Cable Color Coding
(3) International Organization for Standardization (ISO) - 9001
(4) Rural Utilities Service (RUS)- Specification for filled fiber optic cables

All cables shall be new and unused non-armored outdoor cable consisting of non-dispersion shifted, low water peak single-mode fiber strands free of surface imperfections and inclusions. Each single mode fiber strand shall consist of a doped silica core surrounded by a concentric silica cladding. The fiber shall be of matched clad design.

(a) *Fiber Strands.*

Fiber strands shall meet the following minimum characteristics:

(1) Typical core diameter of 9.0µm ± 1 µm
(2) Cladding Diameter of 125 µm ± 1 µm
(3) Core concentricity error: ≤ 0.6 µm
(4) Cladding Noncircularity: ≤ 1.0 %
(5) Coating Diameter (Colored): 245 ± 5 µm
(6) Maximum Attenuation (Loose Tube): 0.35 dB//km at 1310 nm wavelength and 0.22 dB/km at 1550 nm wavelength
(7) Mode-Field Diameter: 9.20 ± 0.30 µm at 1310 nm wavelength and 10.40 ± 0.50 µm at 1550 nm wavelength
(8) Attenuation at the Water Peak: 0.32 to 0.34 dB/km at 1383 ± 3 nm wavelength
(9) Cutoff Wavelength: ≤1260 nm
(10) Zero Dispersion Wavelength: 1300 nm to 1324 nm
(11) Zero Dispersion Slope: ≤ 0.092 ps / (nm^2 * km)
(12) Polarization Mode Dispersion: ≤ 0.06 ps/ $\sqrt{km}$
(13) Maximum Polarization Mode Dispersion at 0.01% distribution (PMDq): 0.20 ps/$\sqrt{km}$
(14) Maximum Fiber Dispersion: ≤ 18 ps/(nm * km) at 1550 nm.
(15) Fiber Curl: ≥ 4.0 m
(16) Proof Tensile Test: 100 kpsi (0.69 GN/m^2)

The fibers shall not adhere to the inside of the buffer tube.

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REVISION OF SECTION 614
FIBER OPTIC CABLE (SINGLE MODE)

The coating shall be a dual layered, UV cured acrylate applied by the fiber manufacturer. The coating shall be capable of being mechanically stripped with a force of 0.3 to 2.0 lbf.

Each single mode fiber strand shall be color coded with distinct and recognizable colors in accordance with the TIA-598-D *Optical Fiber Cable Color Coding*.

(b) *Buffer Tubes.*

Each backbone buffer tube shall contain 12 fiber strands and each lateral fiber cable shall have two buffer tubes with six fiber strands in each.

Optical fibers shall be placed inside a loose buffer tube.

Each buffer tube shall be color coded with distinct and recognizable colors in accordance with TIA-598-D

If fillers are required, they shall be placed in the inner layer of the fiber optic cable. The color sequences of the buffer tubes shall begin from the inside layer of and progress outward.

Buffer tube black stripe shall be inlaid in the buffer tube material by means of co-extrusion when required.

In buffer tubes containing multiple fibers, the coloring shall be stable during temperature cycling and shall not be subjected to fading or smearing onto each other or into the buffer tube gel filling material if the fiber cable is supplied with gel filling for water blocking. Colorings shall not cause fibers to stick together.

Each buffer tube shall contain water blocking swellable yarns to prevent water from entering the individual buffer tubes. Swellable water blocking material shall be non-nutritive to fungus, electrically non-conductive and homogeneous. It shall be free from dirt and foreign matter and not require cleaning prior to splicing and placement into the splice closure tray. All fiber strands shall be thoroughly cleaned prior to fiber splicing. All water blocking material shall be uniformly distributed throughout the buffer tubes.

Buffer tubes shall be stranded around a central member of the cable using a reverse oscillation stranding process.

The buffer tubes shall be resistant to external forces and shall meet the buffer tube cold bend and shrinkback requirements of Code of Federal Regulations (CFR) 7 CFR 1755.900 – *RUS Specification for filled fiber optic cables*.

(c) *Fiber Cable.*

Fillers may be included in the cable core to lend symmetry to the cable cross-section where needed and shall not be placed to interrupt the consecutive positioning of the buffer tubes. Fillers shall nominally match the outer diameter of fiber filled buffer tubes.

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REVISION OF SECTION 614
FIBER OPTIC CABLE (SINGLE MODE)

The central anti-buckling member of the cable shall consist of all dielectric, glass reinforced plastic (GRP) rod.

For single layer cables, a water swellable, (blocking) tape shall be applied longitudinally around the outside of the buffer tubes and fillers. The tape shall be held in place by a single polyester binder yarn. The water swellable tape shall be non-nutritive to fungus, electrically non-conductive, and homogenous. It shall also be free from dirt and foreign matter. Water blocking material shall be applied uniformly throughout the fiber cable to inhibit the ingress of water into the cable. Gel filled water-blocking compound shall not be allowed in the cable core interstices of the fiber optic cables.

When the fiber cable is provided with dual layer buffer tubes, both the inner and outer layer shall be provided with water swellable tape.

Binders shall be applied with sufficient tension to secure the buffer tubes to the central member without crushing the buffer tubes. The binders shall be non-hygroscopic, non-wicking (or rendered so by the flooding compound), and dielectric with low shrinkage.

The cable shall contain at least one ripcord under the sheath for easy sheath removal.

Outer cable jacket shall have a consistent thickness throughout the entire cable length and shall be sheathed with medium density polyethylene (MDPE). Jacketing material shall be applied directly over the tensile strength members and water blocking tape. The MDPE jacket material shall be as defined by ASTM D1248, Type II, Class , Category 4 and Grades J4, E7 and E8 and shall contain carbon black to provide ultraviolet light protection and shall not promote the growth of fungus.

The cable jacket shall be free of holes, splits and blisters and be of a consistent thickness.

Cable jackets shall be marked with the manufacturer's name, sequential foot markings, fiber type and count, month and year of manufacture and a telecommunication handset symbol, as required by Section 350G of the National Electrical Safety Code (NESC). The actual length of the cable shall be within 0 to 1 percent of the length markings. The marking shall be in contrasting color to the cable jacket. The height of the marking shall be easily readable.

The Contractor shall submit to the Department a detailed fiber optic cable specification sheet from the manufacturer for Approval. The specification sheet shall be highlighted describing the water blocking material used for both the cable interstices and buffer tubes. Failure to fully describe the type of water blocking material shall result in the submittal being rejected and resubmitted with all highlighted information.

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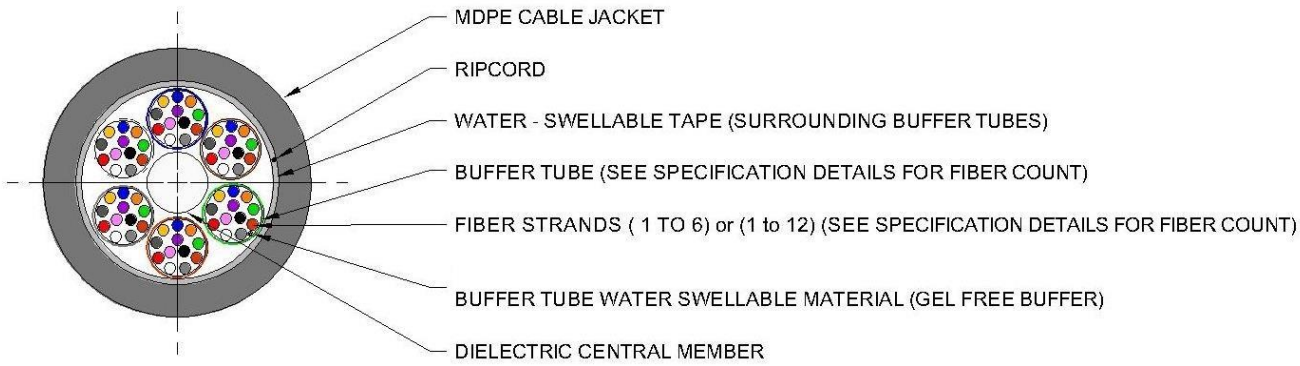
FIBER OPTIC CABLE (SINGLE MODE)



Specification Detail 1

Typical Cross Section of Fiber Optic Cable to Be Provided Per This Specification

(d) *Environmental Parameters.*

The following minimum environmental parameters shall be met:

(1) Shipping, storage and operating temperature range of the cable shall be; -40°F to +158°F (-40°C to +70°C)
(2) Operating temperature range of the cable shall be; -40°F to +158°F (-40°C to +70°C)
(3) Installation temperature range of the cable shall be; -22°F to +140°F (-30°C to +60°C)

(e) *Quality Assurance.*

The following minimum quality assurance requirements shall be met:

(1) All optical fibers shall be 100 percent attenuation tested in accordance with Revision of Section 614 – Test Fiber Optic Cable. The attenuation of each fiber shall be provided with each cable reel.
(2) The cable manufacturer shall be ISO 9001or TL 9000 registered.

(f) *Packaging.*

The following minimum packaging parameters shall be met:

(1) The complete cable shall be packaged for shipment on non-returnable wooden reels.
(2) Top and bottom ends of the cable shall be available for testing.
(3) Both ends of the cable shall be sealed to prevent the ingress of moisture.
(4) Each reel shall have a weatherproof reel tag attached identifying the reel and cable.
(5) Each cable shall be accompanied by a cable data sheet that contains significant information on the cable.
(6) The cable reels shall not be stored nor shipped on their sides.

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REVISION OF SECTION 614
FIBER OPTIC CABLE (SINGLE MODE)

CONSTRUCTION REQUIREMENTS

Fiber optic cable shall be used for either main backbone cable or lateral cables that connect to communications cabinets. The main backbone cable shall be terminated in a traffic management system building or network facility. Splicing shall be conducted at cable end splice locations and device splice locations shown on the Project plans or as Approved by the Department.

A minimum of one week prior to fiber optic work, the Contractor shall give the Department a detailed installation and splicing method statement and schedule. All installation, splicing, termination, and testing shall be listed on the schedule and method statement and revisions shall be re-submitted to the Department immediately. Installation of the fiber optic cable shall not be permitted until the method statement and schedule has been Approved by the Engineer.

The Contractor shall be responsible for coordinating with third parties when installing and splicing proposed fiber optic cable adjacent to existing third party owned fiber optic infrastructure and when splicing proposed fiber optic cable to existing third party owned fiber optic cable. The Contractor shall keep the Department apprised of all coordination activities it performs with third parties as it pertains to this Project.

The Contractor shall conform to the requirements included in the Revision of Section 614 – Test Fiber Optic Cable specification, as well as the project specific Testing & Integration Plan.

The Contractor shall provide the Engineer with two copies of the cable manufacturer's installation instructions for all fiber optic cable. All installations shall be in accordance with the manufacturer's recommendations except as otherwise directed by the Engineer. All additional costs including fiber optic cable associated to damages caused by the Contractor's neglect of recommended procedures, shall be the Contractor's responsibility.

Fiber optic cable including both backbone cables and lateral cables shall be installed in continuous runs. The Contractor shall include a detailed installation plan with the Method Statement showing cable installation lengths and cable end splice points. The fiber cable shall be installed in reel lengths that minimize the quantity of cable end splices. Under no conditions shall fiber optic cable be cut or spliced at intermediate points without express written direction from the Engineer.

The new fiber cable shall be installed in a manner which will not interfere with the integrity of existing cable and equipment and shall be installed in a manner which will not interfere with the maintenance of the traffic signal cable, wiring, or equipment.

Blowing cable is an acceptable alternative to pulling cable. If the Contractor chooses to use this method, submittals for cable installation shall be submitted along with complete information on fiber installation equipment.

The maximum pulling tension shall be 600 pounds (2700 N) during installation (short term) and 200 pounds (890 N) long term installed.

All cables shall have a minimum bending radius based on the diameter of the cable and shall meet the following:

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FIBER OPTIC CABLE (SINGLE MODE)

(1) Under max pulling tension – 15 (Fifteen times the cable outside diameter)
(2) Unloaded, not under tension – 10 (Ten times the cable outside diameter)

The fiber optic cable shall be installed in the conduit with a split-mesh cable grip to provide a firm hold on the exterior covering of the cable.

The manufacturer's recommended maximum allowable pull tension for cable pull lengths shall not be exceeded. The Contractor shall use a pulley system with a numerical readout indicating the cable tension. The pulley system shall be capable of alerting the installer when the cable pulling tension approaches the manufacturer's maximum allowable tension. The Contractor may supplement this procedure with a breakaway tension limiter set below the lowest recommended tensile limit of the cables being pulled. Intermediate pulleys shall be used at all pull boxes or manholes along the installation run to prevent cable damage.

If cable installation limits are met and the entire length cannot be installed completely from the shipping reel, installation shall be continued from the mid-point of the run. The Contractor shall first pull one-half of the cable from the reel at the mid-point through the conduit to one end of the run. The other half of the cable shall be removed from the reel and carefully placed on the ground in a figure eight pattern with a minimum loop diameter of 10 feet. While installing the remaining cable, care shall be taken to avoid dragging against the ground resulting in damage or excess bending of the cable. The Contractor shall not kink, twist or bend the cable during installation coiling and uncoiling.

The cable shall be continuously lubricated as it enters the conduit. The Contractor shall only use pulling lubricants recommended by the cable manufacturer. Liquid detergent shall not be used.

The Contractor shall furnish and install a pre-lubricated pull tape and tracer wire in the same conduit as the fiber is being installed. The pull tape and tracer wire shall conform with Revision of Section 613 – Electrical Conduit.

If the Contractor must install new cable in conduits that contain existing fiber optic cable or electrical wiring, the Contractor shall be responsible for all damage to the existing cables and wires. After this installation the Contractor shall perform a functional test of all the equipment connected by the existing fiber optic cables and electrical wiring to ensure proper working conditions. All costs associated with equipment testing and repairs shall be included in the cost of the fiber optic cable.

If an existing fiber optic cable is damaged during construction, it shall be removed from both points of termination and replaced, at no cost to the Project.

In no case shall the conduit fill ratio of new conduit exceed the requirements of the National Electrical Code.

Lateral cables shall be installed in continuous runs from the backbone splice location to the communications cabinet. Odd length cables and reel ends are acceptable for lateral cables provided they are pre-tested and free of defects and are of sufficient lengths to archive continuous runs.

Installation of lateral fiber optic cables shall include slack coil and a minimum of three strain relief locations within all communications cabinets and traffic signal cabinets.

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REVISION OF SECTION 614
FIBER OPTIC CABLE (SINGLE MODE)

All fiber optic cables shall include identification labels attached to the cable in each pull box, manhole or communications cabinet. The information to be included on the label shall be Approved by the Engineer.

The Contractor shall coil 50 feet of each fiber cable in pull boxes and 100 feet in manholes.

At locations of Coarse Wavelength Division Multiplexing (CWDM) network equipment, the Contractor shall install and coil two separate 100-foot lateral fiber optic cables in the splice manholes. Refer to the fiber optic splicing details for more information.

Splicing of CWDM lateral fiber optic cables by the Contractor shall be as shown in the project plans.

Backbone and lateral buffer tubes and fiber strands shall be labeled on the splice tray prior to sealing of the closure. In the CWDM splice closure, the optical filter wavelengths shall also be labeled.

The Contractor shall ensure that all cable coils and splice canisters are attached separately to the cable management hardware inside manholes in a manner which will allow for all splice closures to be removed separately for future maintenance purposes. In Pull Boxes, all cable coils shall be attached separately to the cable management hardware in a manner which will allow for fiber optic cable to be removed separately.

The Contractor shall terminate the lateral cable at the communications cabinet in accordance with the Revision of Section 614 – Fiber Optic Termination Panel.

Prior to performing splicing and testing for CDOT ramp metering, the Contractor shall contact Joe Pirera, CDOT Traffic Signals & Ramp Metering Supervisor (303-815-9194), to allow for traffic signal technicians to disconnect all existing optical communications equipment.

The Contractor shall submit a final documentation package. The final documentation package shall include the cable manufacturer's installation procedures, technical support documentation and material documentation. These documents shall match the original submittals provided to the Engineer.

At any time, if the Contractor damages any of the fiber optic backbone cables, the entire end-to-end (reel-to-reel) section of fiber cable shall be removed, re-installed, and re-spliced from the cable end splice point at the Contractor's expense.

At any time, if the Contractor damages any of the fiber optic backbone laterals, the entire end-to-end (reel-to-reel) section of fiber cable shall be removed, re-installed, and re-spliced from the splice point to the device communication cabinet at the Contractor's expense.

See project specific Testing & Integration Plan for additional requirements.

REVISION OF SECTION 614
TEST FIBER OPTIC CABLE

Section 614 of the Standard Specifications is hereby revised for this Project to include the following:

DESCRIPTION

Test Fiber Optic Cable shall include Optical Time Domain Reflectometer (OTDR) tests, Coarse Wave Division Multiplexor (CWDM) OTDR tests, spectrum analysis of CWDM fiber, and optical power meter tests of all installed fiber and modified existing fiber on the Project.

MATERIALS

The Contractor shall use equipment that is calibrated annually. A copy of the most recent certificate of calibration and all out-of-tolerance conditions shall be provided to the Department prior to the initiation of testing activities. The following equipment and information is required to perform fiber optic cable tests:

(1) An OTDR (submit certification to the Department)

(2) A Coarse Wave Division Multiplexor OTDR (submit certification to the Department)

(3) An optical spectrum analyzer (submit certification to the Department)

(4) Optical Power Meter Equipment capable of measuring optical power in dBm (submit certification to the Department)

(5) A launch box (min length – 1000 feet)

(6) A light source at the appropriate wavelength

(7) Test jumpers shall be 3 feet to 12 feet long with connectors that are compatible with the light source and power meter and shall have the same fiber construction as the link segment being tested.

CONSTRUCTION REQUIREMENTS

Prior to splicing and testing on the Project the Contractor shall submit a detailed Method Statement to the Department describing the splicing and testing plan and schedule. Discussion of the Contractor's Cutover Plan and a proposed Device Cutover Schedule shall be included in the Method Statement. No fiber optic splicing shall begin until the method statement is submitted and Approved. If at any time it is determined that work began without an Approved method statement, or the work is not following the Approved method statement, an immediate "stop work" order will be issued and work will not resume until the method statement has been submitted and Approved. Once the splicing and testing begins, the method statement shall be updated if necessary to address any changes in the original planned and Approved procedures.

The Contractor shall conduct fiber optic testing at the following stages:

(1) Pre-installation testing – bi-directional OTDR test of every fiber on every reel after delivery of the reel
(2) Post installation and pre-splicing test – bi-directional OTDR test of every fiber of every cable after fiber is installed in the ground
(3) Post-splicing tests, pre-CWDM filter splicing tests
    i) Optical Power meter test from all fiber terminated in communications cabinets to a network facility for all fiber that is not used for CWDM on the Project.

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REVISION OF SECTION 614
TEST FIBER OPTIC CABLE

ii) Bi-directional OTDR test of all fiber between termination point in a network facility and cable end and between termination point in a network facility and communications cabinets for fiber that is not used for CWDM on the Project
iii) Bi-directional CWDM OTDR test of all fiber between termination point in a network facility and cable end and between termination point in a network facility and communications cabinets for all fiber that is used for CWDM on the Project

(4) Post-CWDM filter splicing tests
i) Spectrum analysis of all terminated fiber used for CWDM after filters have been spliced
ii) CWDM-OTDR
iii) Optical Power meter test and documented attenuator values

(5) Re-testing of all stages above if initial test fails and after corrective action is taken

The guidelines for fiber optic cable testing include:

(1) Launch box and test jumpers must be of the same fiber core size and connector type as the cable system: Single mode fiber 9.0µm (nominal) /125 µm
(2) The light source and OTDR must operate within the range of 1310±10 nm and 1550±20 nm single mode nominal wavelength for testing in accordance with Telecommunications Industry Association (TIA) TIA-526-7 Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant.
(3) The power meter and the light source must be set to the same wavelength during testing.
(4) The OTDR and power meter must be calibrated at each of the nominal test wavelengths and traceable to the National Institute for Standards and Technology (NIST) calibration standards.
(5) The calibration of the OTDR and power meter shall conform to the requirements set forth in Telecommunications Industry Association/Electronic Industries Alliance (TIA/EIA) TIA/EIA-455-226 Calibration of Optical Time-Domain Reflectometers and TIA-455-231 Calibration of Fiber Optic Power Meters, respectively.

The Contractor shall document jacket length measurements for lateral and backbone cable at each end including splice enclosures and patch panels and at any intermediate splice points.

The Contractor shall document bare fiber slack not accounted for in jacket length.

All system connectors, adapters and jumpers shall be cleaned per manufacturer's instructions before measurements are taken.

At locations of new lateral fiber optic cable installation and at locations that require the re-installation of existing lateral fiber optic cable, the Contractor shall conduct testing from the termination panel mounted in the communications cabinet to the splicing manhole. The bi-directional test shall be conducted from the termination panel towards the splicing manhole and from the splicing manhole to the communications cabinet termination panel.

Final splicing will not begin until such time that the Contractor submits OTDR test results to the Department and the Department reviews the results.

Final OTDR testing from the communications cabinet to the corresponding node building shall be conducted after their splicing work has been completed. All issues with communications related to

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REVISION OF SECTION 614
TEST FIBER OPTIC CABLE

Contractor installation and workmanship shall be remediated by the Contractor at no additional cost to the project.

A functional test shall be made in which it is shown that each and every part of the system functions as specified or intended herein.

(a) Optical Fiber Cable Testing with OTDR

The Contractor shall perform an OTDR test of all fibers in all tubes on the reel prior to installation of the fiber. The test results shall be supplied to the Department prior to installation of the cable.

Fiber testing shall be performed on all terminated fibers from patch panel to patch panel and unterminated fibers from end to end. Additionally, mid entry splices into mainline cables require testing of all strands in the mainline cable before and after installation. Testing shall consist of a bi-directional end-to-end OTDR trace.

Loss numbers for the installed link shall be calculated by taking the sum of the bi-directional measurements and dividing that sum by two.

The Contractor shall use an OTDR that is capable of storing traces electronically and shall save each final trace.

The Contractor shall use a test reel of minimum length identified in the Materials section of this Special Provision. The Contractor shall indicate the length of the test reel, in feet, for all test results.

If the fiber designation is not indicated on the trace itself, the Contractor shall provide a cross-reference table between the stored trace file name and the fiber designation.

The Contractor shall record the following information during the test procedure:

(1) Name and contact information of person conducting the test
(2) Type of test equipment used (manufacturer, model, serial number, calibration date and valid certification of calibration)
(3) Date test is being performed
(4) Optical source wavelength and spectral width
(5) Fiber identification
(6) Start and end point locations
(7) Test direction
(8) Launch conditions
(9) Method of calculation for the attenuation or attenuation coefficient
(10) Acceptable link attenuation
(11) Cable manufacturer stated index of refraction for cable being tested
(12) Jacket readings in and out of each splice vault and each pull box

(b) Optical Fiber Cable Testing with Optical Power Meter

The Contractor shall conduct an Optical Power Meter Test of each fiber installed.

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REVISION OF SECTION 614
TEST FIBER OPTIC CABLE

Single mode segments shall be tested in one direction at both the 1310 nm and 1550 nm wavelength.

The following information shall be recorded during the test procedure:

(1) Names of personnel conducting the test
(2) Type of test equipment used (manufacturer, model, serial number, calibration date and a valid certification of calibration)
(3) Date test is being performed
(4) Optical source wavelength and spectral width
(5) Fiber identification
(6) Start and end point locations
(7) Test direction
(8) Reference power measurement (when not using a power meter with a Relative Power Measurement Mode)
(9) Measured attenuation of the link segment
(10) Acceptable link attenuation

(c) *Acceptable Attenuation Values*

The Contracter shall calculate acceptable attenuation values for each fiber tested. These values represent the maximum acceptable test values.

The general attenuation equation for all single mode link segments is as follows:

Acceptable Link Attenuation = Cable Attenuation + Connector Attenuation + Splice Attenuation.

8.3 µm (nominal) Single-mode Attenuation Coefficients:

(1) Cable Attenuation=Cable Length (km) x (0.35 dB/km at1310 nm and 0.22 dB/km at1550 nm)
(2) (No. of Mated Connections x 0.50 dB)
(3) Splice Attenuation = Splices x 0.30 dB

(d) Test Procedures

The single mode Optical Power Meter fiber test shall be conducted in accordance with TIA-526-7.

The single mode OTDR test shall be conducted in accordance with TIA-526-7.

Testing for CWDM single wavelength filters (CWDM filter) shall be conducted in the following manner to ensure that the filter Pass, Reflect and Common pigtails are spliced to proper lateral fiber strands. Testing procedures and CWDM data flow information is included on the plans. Testing shall be conducted for all CWDM wavelengths are expressed in nanometer (nm) and applicable to each fiber strand used for data communications. CWDM wavelengths on this Project include 1430 nm, 1450 nm, 1470 nm, 1490 nm, 1510 nm, 1530 nm, 155-nm, 1570 nm, 1590 nm, and 1610 nm. Industry standard wavelengths (e.g. 1430 nm = 1431 nm) shall be observed.

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REVISION OF SECTION 614
TEST FIBER OPTIC CABLE

After completion of fiber optic cable installation and prior to the CWDM filter splicing, all backbone cable to lateral cable splices shall be completed in the individual Ethernet switch sub-rings. Required steps shall include:

(1) The backbone end of Lateral Cable 1 shall be spliced to the fiber optic backbone cable in Splice Closure 1. Once this splice is complete no future access to Splice Closure 1 shall be made unless a re-splice is required.
(2) The opposite end of Lateral Cable 1 shall be spliced to itself in Splice Closure 2 in a manner to achieve continuity in the backbone strands from the beginning of the sub-ring (first node building) to the far end of the sub-ring (next node building).
(3) An OTDR test shall be conducted on the sub-ring from building to building to ensure proper splicing of Lateral Cable 1 in Splice Closure 1.

Once the OTDR test is complete the results shall be submitted to the Department for approval. After approval the splicing of CWDM filters in Splice Closure 2 may begin.

The Contractor shall be required to break the Lateral Cable 1 splices in Splice Closure 2 used in the continuity test and conduct the CWDM filter splicing per the Project fiber splice plans. This will include splicing of Lateral Cable 1 and Lateral Cable 2 in Splice Closure 2 and the termination of Lateral Cable 2 in the communications cabinet.

After CWDM filter splicing, the Contractor may use one of the following methods to ensure the proper CWDM filter splicing.

(1) By using a fiber identifier, testing of the incoming signal from either the upstream or downstream CWDM location, the Contractor shall show the Department that proper CWDM filter pigtail splicing has been achieved.
(2) By using a spectrum analyzer to test the incoming wavelength to ensure proper splicing and wavelength of the CWDM signal.

Once all splicing of the individual sub-ring is complete the Contractor shall conduct the CWDM-OTDR and spectrum analyzer testing and submit the results to the Department. At the acceptance of these tests, the Contractor shall determine the proper optical attenuator to install in the Receive (Rx) ports at both the communications termination panel and the communications node building termination panel. After installation one final test of optical power shall be conducted to determine if the proper signal strength is being achieved by the Ethernet switch CWDM optic.

At that point the Colorado Department of Transportation, Colorado Transportation Management Center personnel along with Ciena network engineers will configure the sub-ring into the overall CDOT ITS network. If network communications cannot be achieved, a review of the CWDM testing materials will begin.

(e) Test Acceptance

The Contractor shall re-splice all fusion splices and re-terminate all terminations that have test results exceeding acceptable attenuation values. The Contractor shall retest all fiber links that have been re-spliced and that have been re-terminated.

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REVISION OF SECTION 614
TEST FIBER OPTIC CABLE

The Contractor shall demonstrate that the tests result in acceptable attenuation values.

The Contractor, solely at the Contractor's expense, shall bring all links not meeting the requirements of this specification into compliance.

(f) Submittals

The Contractor shall submit test result documentation as both a hard copy and electronic copy.

After each reel test, the Contractor shall submit one hard copy of the OTDR trace for every fiber on the reel.

After installation, the Contractor shall submit two hard copies and one electronic copy of the following tests:

(1) Continuity OTDR trace for every spliced fiber which the CWDM optical network will utilize.
(2) OTDR trace for every fiber the high speed DWDM optical network will utilize.
(3) CWDM-OTDR trace for every fiber which the CWDM optical network will utilize.
(4) Spectrum analyzer test results for every fiber which the CWDM optical network will utilize.
(5) OTDR traces and power meter results for all "dark" unused fiber strands in the backbone fiber optic cable from node buildings.

Hard copy traces shall be organized and bound in logical order in an 8 ½ inch x 11 inch hard cover binder.

The Contractor shall submit, after approval of the hard copy traces, electronic copies of all traces (PDF and native file format) and appropriate software, if needed, to allow reading the traces.

The Contractor shall submit one copy of the complete contract Plans, including additional drawings issued as part of all change orders, with all deviations clearly marked in color. Deviations to be noted shall include at a minimum, but not be limited to, the following:

(1) Fiber Splice location
(2) Fiber Splice configuration
(3) Termination layout

After all splicing and fiber optic testing is completed the Contractor shall test the optical power of the incoming, (Receive) signal at each field Ethernet switch and existing node building location. To obtain the most accurate values of optical power, the testing equipment shall be attached to the SFP optic end of the pre-connectorized patch cable.

Once the optical power has been tested, the Contractor shall install the appropriate attenuator in the receive port to meet the receive values of the SFP optic module, including a design margin of 6 dB (to allow for degradation over the life of the system).

REVISION OF SECTION 614
CCD LOOSE TUBE FIBER OPTIC CABLE

Section 614 of the Standard Specifications is hereby revised for this Project as follows.

Notice:

Every effort has been made to ensure that the information contained in this specification is complete and accurate at the time of publication; however, information contained herein is subject to change.

Trademarks:

ANSI® is a registered trademark of the American National Standards Institute, Inc. KELLEMS® is a registered trademark of Harvey Hubbell, Inc.

Scope:

This specification covers the general design requirements and performance standards for fiber optic cables intended primarily for use in the outside plant environment. The purpose of this document is to provide the essential requirements for All-Dielectric Single Jacket, Single Jacket / Single Armor, and Double Jacket / Single Armor Loose Tube Fiber Optic cable to be used in the City of Denver networks.

The product requirements and features described in this specification are those considered useful for ensuring proper selection and manufacturing of fiber optic outside plant cables.

In this specification, all observed or calculated values are rounded off "to the nearest unit" in the last right hand place of figures used in expressing the limiting value. The round-off method of ASTM E 29 is used.

These cables should comply with industry standards such as Telcordia Technologies GR-20 (formerly Bellcore), Electronic Industries Association (EIA), Telecommunications Industry Association (TIA), International Telecommunications Union (ITU), International Electrotechnical Commission (IEC), and American Society for Testing and Materials (ASTM).

Optical Fiber Characteristics:

High quality optical fibers should be made with pure silica-based glass to have very low loss for infrared wavelengths and to be used to carry large amounts of information for very long distances in optical communication systems.

Details of the optical fibers are not covered in this specification, but the proposed cable should contain AllWave® or TrueWave® fibers for Single-Mode applications, or Multimode fibers that comply with the specific fiber requirements supplied by the City of Denver.

Cable Core Characteristic:

1. Color Code:

   The individual colors for fibers and buffer tubes in loose tube cable cores should comply with EIA/TIA-598 as given in the following table.

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CCD LOOSE TUBE FIBER OPTIC CABLE

Table 1 – Fiber and Tube Color Code

Fiber or Tube No.	Color
1	Blue (BL)
2	Orange (OR)
3	Green (GR)
4	Brown (BR)
5	Slate (SL)
6	White (WH)
7	Red (RD)
8	Black (BK)
9	Yellow (YL)
10	Violet (VI)
11	Rose (RS)
12	Aqua (AQ)

2. Central Strength Member

The central member functions as an anti-buckling element, and should be a glass/epoxy composite dielectric rod. A polyethylene overcoat may be applied to the central member to provide the proper spacing between buffer tubes during stranding.

3. Loose Tube Cable Buffer Tubes

Optical fibers are enclosed within buffer tubes that have a diameter several times larger than the diameter of the fibers. The optical fibers are loose within the buffer tubes allowing the fibers to move freely. The loose buffer tubes should have a 2.5 mm diameter, with a nominal wall thickness of 0.4 mm. For composite cable designs when both and multi-mode fibers are contained within the same cable, the single-mode fibers will be contained in the first buffer tubes. The multi-mode fibers will be contained in the sequenced buffer tubes following the multi-mode buffer tubes.

Table 2 – Buffer Tubes

Fiber Count	Buffer Tube OD (mm)	Fibers per Tube
1-288	2.5	12

The buffer tubes (and filler rods, if necessary) must be stranded in a reverse oscillation lay (ROL) technique around the central member to allow for easy mid-span access. The core of buffer tubes should be wrapped with two counter helically applied threads to bind together the cable core.

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REVISION OF SECTION 614
CCD LOOSE TUBE FIBER OPTIC CABLE

4. Filler Rods

In order to create a round cable, filler rods of the same diameter as the buffer tubes may be used to fill empty positions. Filler rods are made out of HDPE and are natural in color.

5. Water Blocking System

Water blocking of the core outside and around the buffer tubes must be accomplished via "dry" elements. **In addition, water-blocking <u>inside</u> the buffer tubes must be accomplished via "dry" elements as well.**

These "dry" water blocking elements form a gel compound when in contact with water. The gel should effectively fill the interstices of the core and the inside of the tubes to prevent water penetration along the length of the cable. This dry water blocking significantly reduces cable core access time by eliminating the step of cleaning the buffer tubes and fibers upon entry. Additionally, this technology reduces the cable weight.

Dry water blocking elements should be in the form of binders, tapes, or yarns depending on where they are being applied.

Cable Sheath Characteristic:

The sheaths described in this section are:

- All-Dielectric Single Jacket: One polyethylene jacket, no metallic elements (SJ)
- Strength Elements: Sheath strength elements are applied over the cable core to provide the cable with the required tensile strength. These elements are made of fiberglass (Aramid yarns may be used as well).
- Inner Jacket (NOT APPLICABLE TO THIS PROJECT)
- Steel Armor (NOT APPLICABLE TO THIS PROJECT)
- Outer Jacket: An outer polyethylene jacket is applied over the cable to provide overall mechanical protection. This jacket is made of MDPE (or HDPE upon request) and is usually black. If required, the jacket could have two co-extruded colored tracer stripes located 180 degrees apart to aid in cable identification. The jacket will be continuous, free from pinholes, splits, blisters, or other imperfections.
- Ripcords: For ease of jacket removal, one clearly identifiable polyester ripcord is provided under the outer jacket for SJ designs. SJ/SA designs shall have two under armor ripcords placed 180 degrees apart. DJ/SA designs shall have one ripcord under both the inner jacket and steel armor.

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CCD LOOSE TUBE FIBER OPTIC CABLE

Cable Cross-Sections: Single Jacket (SJ)

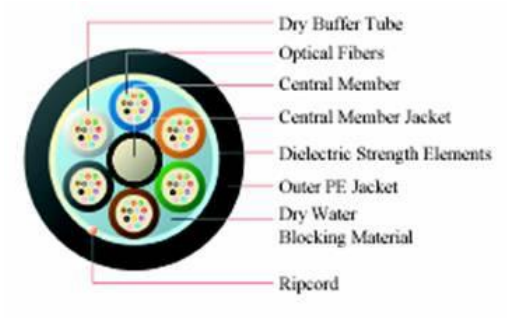

Figure 1 – Single Jacket

Table 3 – Target Cable Outer Diameters

	Number of Fibers							
	2 - 60 (5 Pos.)	**2 - 72 (6 Pos.)**	**73 - 96 (8 Pos.)**	**97 - 120 (10 Pos.)**	**121- 44 (12 Pos.)**	**145-216 (18 Pos.)**	**217-240 (20 Pos.)**	**241-288 (24 Pos.)**
Sheath Type	Cable OD in. (mm)	Cable OD in. (mm)	Cable OD in. (mm)	Cable OD in. (mm)	Cable OD in. (mm)	Cable OD in. (mm)	Cable OD in. (mm)	Cable OD in. (mm)
SJ	0.42 (10.6)	0.43 (11.0)	0.50 (12.8)	0.57 (14.4)	0.64 (16.2)	0.66 (16.7)	0.69 (17.4)	0.76 (19.2)

Mechanical, Environmental and Electrical Requirements:

These cables must meet the requirements of *Telcordia GR-20-CORE* with all testing performed based on *EIA/TIA-455* standards. The manufacturing company must provide proof of their quality control standards with *ISO 9001* and *TL9000* certifications. The cables should comply with the following temperature ranges:

Operation:	-40°C to 70°C (-40°F to 158°F)
Installation:	-30°C to 60°C (-22°F to 140°F)
Storage/Shipping:	-40°C to 75°C (-40°F to 167°F)

Single-Mode Fibers:

Per *Telcordia GR-20*, the magnitude of the attenuation change shall be less than or equal to 0.05 dB for 90% of the test fibers and less than or equal to 0.15 dB for the remaining 10% of test fibers. Cable aging allows for 0.10 dB/km average attenuation change with a magnitude of the maximum attenuation change for each individual fiber to be less than 0.25dB/km. These attenuation values include a 0.05 dB allowance for measurement repeatability During mechanical and environmental testing evidence of cracking, splitting or other failure of the sheath components when examined under 5X magnification would result in failure of the proposed test requirements. In addition, no fiber shall lose optical continuity because of the test.

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Table 4 – Testing for Single Mode Fibers

Cable Test	Test Method	Requirement
Tensile Loading and Bending	EIA/TIA-455-33 IEC 794-1-E1	90% < 0.05 dB Max. Added Loss 100% < 0.15 dB Max. Added Loss
Cyclic Flexing	TIA/EIA-455-104 IEC 794-1-E6	90% < 0.05 dB Max. Added Loss 100% < 0.15 dB Max. Added Loss
Cyclic Impact	EIA/TIA-455-25 IEC 794-1-E4	90% < 0.05 dB Max. Added Loss 100% < 0.15 dB Max. Added Loss
Compressive Loading	TIA/EIA-455-41 IEC 794-1-E3	90% < 0.05 dB Max. Added Loss 100% < 0.15 dB Max. Added Loss
Twist	TIA/EIA-455-85 IEC 794-1-E7	90% < 0.05 dB Max. Added Loss 100% < 0.15 dB Max. Added Loss
Low and High Temperature Bend	EIA/TIA-455-37 IEC 794-1-E11	90% < 0.05 dB Max. Added Loss 100% < 0.15 dB Max. Added Loss
External Freezing	EIA/TIA-455-98 IEC 794-1-F6	< 0.05 dB Mean Added Loss < 0.15 dB Max. Added Loss
Temperature Cycling	EIA/TIA-455-3 IEC 794-1-F1	< 0.05 dB/km Mean Added Loss < 0.15 dB/km Max Added Loss
Cable Aging	EIA/TIA-455-3 IEC 794-1-F1	< 0.10 dB/km Mean Added Loss < 0.25 dB/km Max Added Loss
Water Penetration	EIA/TIA-455-82 IEC 794-1-F5	No flow after 24 hours from one meter length of cable

Multimode Fibers

Per *Telcordia GR-20*, the allowable attenuation increase during the mechanical and environmental testing is 0.20 dB. Cable aging allows for the maximum attenuation change for each individual fiber to be less than 0.40dB/km.

During mechanical and environmental testing evidence of cracking, splitting or other failure of the sheath components when examined under 5X magnification would result in failure of the proposed test requirements. In addition, no fiber shall lose optical continuity because of the test.

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REVISION OF SECTION 614
CCD LOOSE TUBE FIBER OPTIC CABLE

Table 5 – Testing for Multi-Mode Fibers

Cable Test	Test Method	Requirement
Tensile Loading and Bending	EIA/TIA-455-33 IEC 794-1-E1	0.20 dB Max. Mean Added Loss
Cyclic Flexing	TIA/EIA-455-104 IEC 794-1-E6	0.20 dB Max. Mean Added Loss
Cyclic Impact	EIA/TIA-455-25 IEC 794-1-E4	0.40 dB Max. Mean Added Loss
Compressive Loading	TIA/EIA-455-41 IEC 794-1-E3	0.20 dB Max. Mean Added Loss
Twist	TIA/EIA-455-85 IEC 794-1-E7	0.20 dB Max. Mean Added Loss
Low and High Temperature Bend	EIA/TIA-455-37 IEC 794-1-E11	0.40 dB Max. Mean Added Loss
External Freezing	EIA/TIA-455-98 IEC 794-1-F6	0.20 dB Max. Mean Added Loss
Temperature Cycling	EIA/TIA-455-3 IEC 794-1-F1	< 0.5 dB/km Max Added Loss 80 % < 0.25 dB/km Added Loss
Cable Aging	EIA/TIA-455-3 IEC 794-1-F1	< 1.0 dB/km Max Added Loss 80 % < 0.5 dB/km Added Loss
Water Penetration	EIA/TIA-455-82 IEC 794-1-F5	No flow after one hour from one meter length of cable

Note:

The tensile rating for all of the cables described should be 2.7 kN (600 lbf), with a compression rating of at least 220 N/cm under GR-20 requirements.

Cable Marking:

Printed Characters.

For standard outer jackets, printed characters shall be indent printed with white characters for black jackets, black characters for non-black jackets, or as otherwise specified.

For standard striped outer jackets, printed characters shall be indent printed with white characters for red, green, orange, yellow, blue striped cables, light-blue characters for white striped cables, or as otherwise specified by the customer.

The characters shall be of proper height and space to produce good legibility. Character heights of

2 mm should facilitate adequate readability. An occasional illegible marking is permitted if there is a legible marking on either side.

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Markings.

The cable shall be sequentially marked at one meter, or two-foot intervals depending on specific requirements issued by the City of Denver. The length marks shall not be reset to zero on any length of the cable. The actual length of cable shall be within +1, -0% of the marked length.

Each length of cable shall be marked with the following legend:

"(Manufacturer Name) OPTICAL CABLE, (Product Part Number), (Month and Year of

Manufacture, [MM-YY]), (Telephone Symbol [ ]), (Fiber Count [XXX F], where

XXX is the number of optical fibers in the cable), and (Manufacturers' Serial Number) "

Re-Markings

Only one remarking is permitted. If required, either of the following methods for remarking shall be used:

Method A: Completely remove the defective marking and remark the characters with the original color.

Method B: Leave the defective marking on the jacket and remark on a different portion of the cable jacket with yellow character print. The new number sequence shall differ from any other existing marking by at least 5000.

Any cable that contains two sets of markings shall be labeled to indicate the color and sequential numbers to be used. The labeling shall also be applied to the reel tag.

Cable Packaging:

Reels.

The manufacturer shall supply the product using their standard reel sizes, methods, apparatus, and reel wood lagging, but stenciled according to these specifications. The specifications outlined here are guidelines on what is expected with respect to packaging.

Reels are assumed to be in good working condition, firm, and be able to support the product through shipping and final installation. Reels shall be clean, dry and free of excessive dirt. All reels shall be checked for high nails, stave fit and proper stenciling.

Reel Labels.

Each wooden reel shall be permanently marked with the following information:

- "(Manufacturer's name)" (red paint)
- "OPTICAL CABLE" (black paint)

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CCD LOOSE TUBE FIBER OPTIC CABLE

- An arrow and the wording "cable end" to indicate the position of the outside cable end. (red paint)
- An arrow and the wording "ROLL THIS WAY" to indicate the direction the reel should be rolled to prevent loosening of the cable. (black paint)
- Reel Number (red paint)

Cable handling stickers/cards must be attached to both flanges of every reel. Each sticker must be stapled to the flange. See Figure 4 for illustrations of the stickers to be used.

Reel Lagging:

Thermal Protection.

Outer layers of the reel shall be covered with a protective wrap to limit the solar heating of the cable. This helps limit the cable surface temperature so that it will not exceed 10 C (18 F) above ambient temperature under maximum solar radiation according to Telcordia GR-20 requirements.

All foil wrap shall be securely fastened to the cable by at least 2 pieces of strapping tape.

Composite & Wood Lagging.

Reels shipping domestically shall be lagged with a suitable protective wrap (can be the same thermal protection wrap) and banded with steel straps. This wrap shall cover the cable from flange to flange and provided some mechanical protection to the outer layers of cable as well as weather resistance. Reels shipping for export shall be lagged with wooden boards nailed to each flange and banded with steel straps in addition to the protective wrap around the outer layers of cable.

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Figure 4 – Reel Stickers

Other:

Cable Ends.

Each end of the cable shall have end seals, either end caps or KELLEMS® pulling grips, in order to prevent moisture ingress into the cable during shipping, storage, or installation.

The top end of the cable shall be securely fastened to the inside of the reel flange to prevent the cable from becoming loose in transit or during handling. The bottom end, “test tail”, shall be approximately three meters in length and easily accessible. The end shall be protected within a cable slot and be securely fastened to the outside of the reel flange with wire ties or walkout straps. Staples, nails or yarn attached to the reel during manufacturing shall be removed.

The cable slot can be partially protected to prevent the cable tail from moving outside this, however for export orders the cable slot must be completely sealed by either metallic protection rings, plywood covers, or other.

Cable Length Tolerance.

Cables ordered to standard factory lengths shall have an actual length within –0% and +5% of the length ordered unless otherwise specified by the customer.

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CCD LOOSE TUBE FIBER OPTIC CABLE

Certified Test Data.

Each cable shall have certified test data securely fastened to the reel in a waterproof wrapping. The certified test data sheet shall include the following information:

- Cable Number
- Date
- Customer Name
- Ordered Length
- Customer Order Number
- Ship Length
- Customer Cable Code
- Customer Reel Number
- Customer's Attenuation Specification(s)
- Number of Fibers
- Cable Construction
- Fiber Transmission Data
- Bandwidth Data – only applies to Multi-Mode Fibers
- Authorized Signature

Reel Tag.

Each cable shall have a reel tag securely fastened to the reel in a waterproof wrapping. The Reel Tag (Cut Length Data Sheet) shall include the following information:

- Cable Number
- Date
- Customer Name
- Ordered Length
- Customer Order Number
- Ship Length
- Customer Cable Code
- Customer Reel Number
- Customer's Attenuation Specification(s)
- Number of Fibers
- Beginning and Ending Sequential Length Markings
- Gross Weight
- Net Weight
- Inspected By Signature

REVISION OF SECTION 614
CCD TEST FIBER OPTIC CABLE

Section 614 of the Standard Specifications is hereby revised for this project as follows.

Subsection 614.08(p), CCD Test Fiber Optic Cable, is hereby added to the Standard Specifications and shall include the following:

This work consists of testing fiber optic cable for CCD. Testing shall include both new cable and existing cable. The test procedures involve an OTDR test and an Optical Power Meter Test.

The guidelines for fiber optic cable testing include:

Test jumpers and patch cords must be of the same fiber core size and connector type as the cable system.

The light source and OTDR must operate with the range of 1310±10 nm or 1550±20 nm for testing in accordance with ANSI/EIA/TIA-526-7.

The power meter and the light source must be set to the same wavelength during testing.

The power meter must be calibrated and traceable to the National Institute of Standards and Technology (NIST).

All system connectors, adapters and jumpers must be cleaned as per manufacturer's instructions before measurements are taken.

MATERIALS

The following items are required to perform fiber optic cable tests:

- an OTDR;
- a test reel, if necessary;
- a light source at the appropriate wavelength;
- Optical Power Measurement Equipment; and
- Test Jumpers as specified below.

(a) CPR Test Jumper-1 and Test Jumper-2 shall be 1-5 meters long with connectors compatible with the light source and power meter and have the same fiber construction as the link segment being tested.

OPTICAL FIBER CABLE TESTING WITH O.T.D.R

The Contractor shall perform an OTDR test of all fibers in all tubes on the reel prior to installation of the fiber. The test results shall be supplied to the Engineer prior to installation of the cable.

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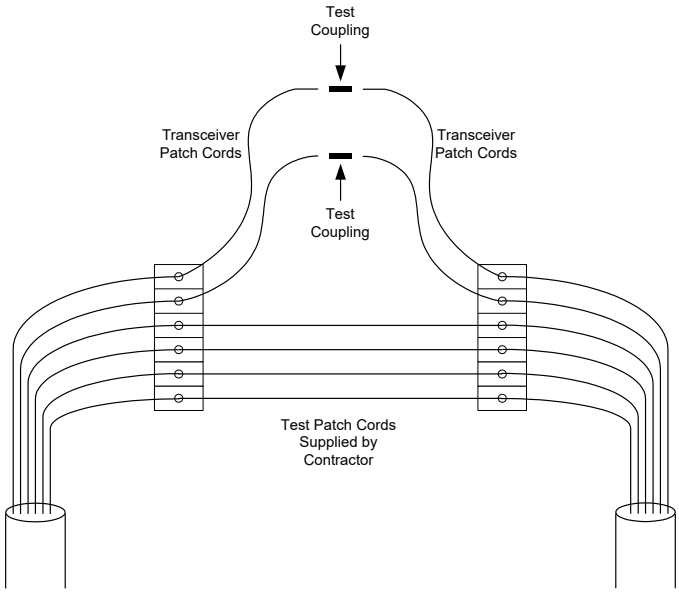
CCD TEST FIBER OPTIC CABLE

If the fiber is specified as "Install Only", the Contractor shall test the fiber on the reel and provide the test results to the Engineer prior to accepting the cable. After installation, if there are unused portions of cable remaining on the reel, the Engineer may request the Contractor or other qualified technician to perform a reel test. The Contractor shall provide the Engineer the test results prior to delivering the cable to the Engineer. Any cable damaged while in the Contractor's possession shall be replaced at the Contractor's expense.

All fiber testing shall be performed on all fibers in the completed end-to-end system. Testing shall consist of a bi-directional end-to-end OTDR trace performed per TIA/EIA-455-61. The system margin loss measurements shall be provided at 1310 and 1550nm. If the Plans require installation of a fiber optic patch panel, the Contractor shall supply patch cords to patch all terminated fibers through the panel for all fiber testing. If patch cords are specified in the Plans for final equipment installation, these patch cords shall be connected using a test coupling for the end-to-end test.



OTDR readings will be used to ensure proper installation and to troubleshoot faults. OTDR signature traces will be used for documentation and maintenance. An OTDR provides an indirect estimate of the loss of the cable plant, generally, more accurate or reliable values will be obtained by using an Optical Power Meter. For fibers that are identified in the Plans to be left non-terminated, an OTDR shall be used to test end-to-end attenuation.

Loss numbers for the installed link shall be calculated by taking the sum of the bi-directional measurements and dividing that sum by two.

The Contractor shall use an OTDR that is capable of storing traces electronically and shall save each final trace.

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REVISION OF SECTION 614
CCD TEST FIBER OPTIC CABLE

To ensure the traces identify the end points of the fiber under test and the fiber designation, the Contractor shall use a test reel, if required, to eliminate the "dead zone" at the start of the trace so that the start of the fiber under test can be identified on the trace. Indicate the length of the test reel for all test results.

If the fiber designation is not indicated on the trace itself, the Contractor shall provide a cross-reference table between the stored trace file name and the fiber designation.

In compliance with EIA/TIA-455-61 "Measurement of Fiber or Cable Attenuation Using an OTDR" the Contractor shall record the following information during the test procedure:

- Names of personnel conducting the test.
- Type of test equipment used (manufacturer, model, serial number, calibration date).
- Date test is being performed.
- Optical source wavelength and spectral width.
- Fiber identification.
- End point locations.
- Launch conditions.
- Method of calculation for the attenuation or attenuation coefficient.
- Acceptable link attenuation.

OPTIC FIBER CABLE TESTING WITH OPTICAL POWER METER

The Contractor shall conduct an Optical Power Meter Test for each fiber installed.

Fiber optic cable segments shall be tested in one direction at both the 1310 nm and 1550 nm wavelength.

In compliance with TIA/EIA-526-7 "Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant," the following information shall be recorded during the test procedure:

- Names of personnel conducting the test.
- Type of test equipment used (manufacturer, model, serial number, calibration date).
- Date test is being performed.
- Optical source wavelength and spectral width.
- Fiber identification.
- End point locations.
- Test direction.
- Reference power measurement (when not using a power meter with a Relative Power Measurement Mode).
- Measured attenuation of the link segment.
- Acceptable link attenuation.

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REVISION OF SECTION 614
CCD TEST FIBER OPTIC CABLE

The minor attenuation differences due to test direction are on par with the accuracy and repeatability of the test method. Lateral segments within a building are limited to 90 meters. Therefore, attenuation differences caused by wavelength are insignificant, and as a result, single wavelength testing is sufficient.

ACCEPTABLE ATTENUATION VALUES

Acceptable attenuation values shall be calculated for each fiber tested. These values represent the maximum acceptable test values.

SM Fiber. The general attenuation equation for any SM link segment is as follows:

Acceptable Link Attn. = Cable Attn. + Connector Attn. + Splice Attn.

8.3 µm Single-mode Attenuation Coefficients:

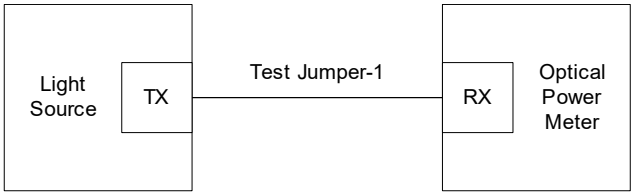
Cable Attn.=Cable Length (km) x (0.34 dB/km@1310 nm or 0.25 dB/km@1550 nm)
Connection Attn. (ST or SC connectors)=(No. of Connections x 0.39 dB)+0.42 dB.
Connection Attn. (LC connectors)=(No. of Connections x 0.14 dB)+0.24 dB.
Splice Attn. (Mechanical or Fusion)=Splices x 0.30 dB.

TEST PROCEDURES

All fiber testing shall be performed on all fibers in the completed end-to-end system.

The Optical Power Meter fiber test shall be conducted as follows:

Clean the test jumper connectors and the test coupling per manufacturer's instructions.
Follow the test equipment manufacturer's initial adjustment instructions.
Connect Test Jumper-1 between the light source and the power meter. Avoid placing bends in the jumper that are less than 100 mm (4 inches) in diameter.



If the power meter has a Relative Power Measurement Mode, select it. If it does not, reduce the Reference Power Measurement (P_{ref}). If the meter can display power levels in dBm, select this unit of measurement to simplify subsequent calculations.

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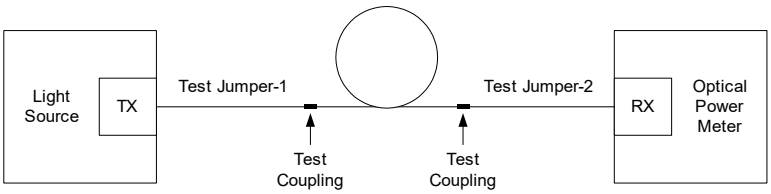
REVISION OF SECTION 614
CCD TEST FIBER OPTIC CABLE

Disconnect Test Jumper-1 from the power meter. Do NOT disconnect the test jumper from the light source.

Attach Test Jumper-1 to one end of the cable plant to be measured and Test Jumper-2 to the other end.



Record the Power Measurement (P_{sum}). If the power meter is in Relative Power Measurement Mode, the meter reading represents the true value. If the meter does not have a Relative Power Measurement Mode, perform the following calculation:

If P_{sum} and P_{ref} are in the same logarithmic units (dBm, dBu, etc.):
CPR (dB) = P_{sum} - P_{ref}
If P_{sum} and P_{ref} are in watts:
CPR (dB)= 10 x $\log_{10}$ [O_{sum}/P_{ref}]

TEST ACCEPTANCE

The Contractor shall demonstrate that each Optical Power Test results in acceptable attenuation values.

The Contractor, solely at the Contractor's cost, shall remake any fusion splices that have test results exceeding acceptable attenuation values.

The Contractor, solely at the Contractor's cost, shall retest any fiber links that have been re-spliced.

The Contractor, solely at the Contractor's cost, shall bring any link not meeting the requirements of this specification into compliance.

SUBMITTALS

The Contractor shall submit test results documentation as both a hard copy and electronic copy.

After each reel test, the Contractor shall submit one hard copy of the OTDR trace for every fiber on the reel. After installation, the Contractor shall submit one hard copy of the OTDR trace for every spliced fiber. Hard copy traces shall be organized and bound in logical order in an 8 ½" x 11" hard cover binder.

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REVISION OF SECTION 614
CCD TEST FIBER OPTIC CABLE

The Contractor shall submit, after approval of the hard copy traces, electronic copies of all traces and appropriate software to allow reading the traces. The Contractor shall submit one copy of the complete contract Plans, including additional drawings issued as part of any change orders, with any deviations clearly marked in color. Deviations to be noted and shall include but not be limited to the following:

- Fiber Splice location;
- Fiber Splice configuration; and
- Termination layout.

REVISION OF SECTION 614
PACKETWAVE PLATFORM (8700)

Section 614 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

For this project, a Packetwave Platform shall be a Ciena 8700, which is a multi-terabit programmable Ethernet-over-Dense Wavelength Division Multiplexing (DWDM) packet switch. It shall be used to aggregate and switch large quantities of packet traffic and to address changes to the patterns, dynamics, and scale of traffic within CDOT's DWDM and Carrier Ethernet network.

There is one complete new Ciena 8700 Packetwave Platform to be installed as part of this Project.

The location for the new installation of Ciena 8700 Packetwave Platform is:

1. Interstate 70 and Airport Boulevard TMS Building

MATERIALS

The Ciena 8700 Packetwave Platform shall be configured for both control plane and switch fabric redundancy.

The Contractor shall furnish and install the Ciena 8700 Packetwave Platform and associated items as shown in Item Table 1 below.

All associated hardware and materials not listed in the item table are considered subsidiary and required for a complete installation and shall be included as part of the work.

Each Ciena 8700 Packetwave Platform shall be furnished and installed with a G.8032 ring protection configuration in conformance with Ciena's Ethernet Design and Configuration Services per the Department's requirements either prior to installation or during installation and configuration.

Final configuration including all IP schema design for data transport will be conducted by CDOT personnel and Ciena representatives after installation and G.8032 configuration.

If field changes are made which affect the original Contractor's material order for the Packetwave Platform and require any reconfiguration of the original order, the Contractor shall ensure that the Ciena representative is contacted and made aware of such changes to alleviate any possible delays in delivery and installation.

If for any reason the switch or associated materials are defective or are damaged at the time of installation by either the Contractor or by Ciena, the item shall be removed and replaced at no additional cost to the project. Items shall also be replaced if any failures occur do to manufacturer's defects, at no additional cost to the project prior to the final acceptance.

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REVISION OF SECTION 614
PACKETWAVE PLATFORM (8700)

Item Table 1 – Ciena 8700 Packetwave Platform

This item table includes materials for a complete Platform installation at this location.

Item Description	Item Number	Quantity
Chassis		
8700, Base System Chassis, 4 slots	154-8700-930	1
8700, Fan Tray, for use in 4 slot systems	154-0008-900	1
8700, System I/O Module, Alarm, Console, Mgt, Timing I/F	154-0004-900	1
Common Cards		
8700, Control, Timing & Switch Module, CTX, for use in 4 slot and 10 slot system	154-0005-900	2
8700, Switch Fabric Module, SM, for use in 4 slot and 10 slot system	154-0006-900	1
Line Modules		
8700, PSLM-200-20, (20) X 1GigE/10GigE SFP+ Line Module	154-0400-900	2
Base Software		
Base Software		
SAOS Advanced Ethernet & OAM Perpetual Software License for 8700 PSLM-200-20	S54-0001-900	2
SAOS MPLS Perpetual Software License per 8700 PSLM & CSLM	S54-0004-900	2
Optional OS Applications		
SAOS Advanced Security Perpetual Software License for 8700 System	S54-0002-900	1
ESM Carrier Edition Right to Manage Perpetual Software License for 8700 System	S54-0006-900	1
Power		
8700, AC PSU, for use in 10 slot and 4 slot systems	154-0001-900	2
8700, AC Power Cord, 16 feet, open end cable	154-0053-900	2
8700, Spare Fuse Kit, PSU	154-0055-900	1
Fillers/Covers		
8700, Line Module Blank Slot Cover	154-0012-900	2
SFP+ Optics		
10GE Optics		
10 Gig, MM SFP+, LC Connector, 300 meters, 850nm, extended temperature	XCVR-S00Z85	2
10 Gig, SM SFP+, LC Connector, 10km, 1310nm, extended temperature	XCVR-S10V31	2
10 Gig, SM SFP+, LC Connector, 40km, 1550nm, extended temperature	XCVR-S40V55	2
10 Gig, SM SFP+, LC Connector, 80km, 1550nm, extended temperature	XCVR-S80V55	2
Cables		
DB9F to EIA-RJ45M Standard, 6 feet serial console cable	170-0063-900	1

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REVISION OF SECTION 614
PACKETWAVE PLATFORM (8700)

Item Description	Item Number	Quantity
Maintenance Services		
8700 4-Slot		
8700 4-Slot SmartSupport – 3 years	80M-8704-SSP	1
8700 4-Slot Standard Hardware Repair 30-day – 3 years	80M-8704-HWM	1
8700 4-Slot Next Business Day Ship Managed Spares – 3 years	80M-8704-NBS	1

The Contractor shall contact the Ciena distributor for equipment quotations and purchasing purposes only. The Contractor shall not contact or rely on either the Ciena distributor or Ciena for network design related questions. It is the Contractor's responsibility to provide the distributer's representative all information required pertaining to the complete network design as shown in the project plans. All questions pertaining to the network design shall be conducted through the Project Engineer for help or clarification.

When requesting quotations, the Contractor shall submit to Ciena distributor or Ciena a complete package including the following items:

1. A complete list of required equipment for purchase including materials and quantities based on the individual pay item project specifications including those stated under the Method of Measurement section of the specification to achieve a complete item(s) installation per the project plans.

2. A PDF copy of all project specifications pertaining to the material being ordered.

3. A PDF copy of all networking project plan sheets.

CONSTRUCTION REQUIREMENTS

The Contractor shall furnish the Ciena 8700 Packetwave Platforms for the TMS Building as previously indicated. After the Contractor has placed the final order through the Ciena distributor's representative, the order will be forwarded to Ciena for staging and configuration for the Packetwave Platform. Once the Packetwave Platform is complete and ready to ship by Ciena, all materials will be shipped to the Colorado Transportation Management Center directly from the Ciena facility.

When all material has arrived at the CTMC, CDOT personnel and Ciena representatives will schedule and conduct the installations. While the CDOT and Ciena personnel install the Packetwave Platform, the Contractor shall continue installation of the Ethernet Switches being purchased and installed as part of this project. This includes the Ciena 3930 Ethernet Switches, Ciena 3931 Ethernet Switches, Ciena 5150 Ethernet Switches, and the Ciena 5160 Ethernet Switches.

This work includes all items shown in Item Table 1; staging and configuration of the Ciena 8700 Packetwave Platform. Work includes all CAT6 Ethernet cables as well as multimode and single mode fiber optic pre-connectorized patch cables.

REVISION OF SECTION 614
CARRIER ETHERNET PACKET-OPTICAL PLATFORM (6500)

Section 614 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

For this project, Carrier Ethernet Packet-Optical Platform shall be a Ciena 6500 Carrier Ethernet Packet-Optical Platform utilizing Dense Wavelength Division Multiplexing (DWDM) optics installed in communication node buildings to bi-directionally transport Ethernet data in a high speed backbone design. All Ciena 6500 Carrier Ethernet Packet-Optical Platform and upgrade network equipment shall be manufactured by Ciena.

There is one new Ciena 6500 Carrier Ethernet Platform required to be furnished and installed on this project.

The locations for the new installation of Ciena 6500 Carrier Ethernet Platforms is as follows;

1. Interstate 70 and Airport Boulevard.

MATERIALS

The Ciena 6500 Carrier Ethernet Packet-Optical Platforms shall be configured in both a full service configuration and a drop and repeat / regeneration configuration.

The Contractor shall furnish and install the Ethernet Platforms and associated items for each location as shown in Item Tables 1, 2, 3, 4 and 5 below.

All associated hardware and materials not listed in the item tables are considered subsidiary and required for a complete installation and shall be included as part of the work.

Each Ciena 6500 Carrier Ethernet Platform shall be furnished and installed with a G.8032 ring protection configuration in conformance with Ciena's Ethernet Design and Configuration Services per the Colorado

Department of Transportation (CDOT) requirements either prior to installation or at the individual installation sites.

Final configuration including all IP schema design for data transport will be conducted by CDOT personnel and Ciena representatives after installation and G.8032 configuration.

If field changes are made which affect the original Contractor's material order for the Ethernet Platforms and require any reconfiguration of the original order, the Contractor shall ensure that the Ciena representative is contacted and made aware of such changes to alleviate any possible delays in delivery and installation.

If for any reason the switch or associated materials are defective or are damaged at the time of installation by either the Contractor or by Ciena, the item shall be removed and replaced at no additional cost to the project. Items shall also be replaced if any failures occur do to manufacture's defects, at no additional cost to the project prior to the final acceptance.

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REVISION OF SECTION 614
CARRIER ETHERNET PACKET-OPTICAL PLATFORM (6500)

Item Table 1 – Ciena 6500 Carrier Ethernet Packet-Optical Platform, I-70 and Airport Blvd.

This item table includes materials for a complete Platform installation at this location.

Item Description	Item Number	Quantity
Testing & Staging		
OME6500 14 Slot Stage Each Shelf OME6500 Plugs In Place Kit	800-6514-SIF NTYY99CRE6	1 1
6500 Shelves		
Optical Shelf (CNVD)	NTK503ADE5	1
Shelf Brackets		
Shelf Brkt Kit, 465 C-C, 127 S/B, EIA HP, O-RE Shlf	NTK509MCE6	1
Cooling Unit Equipment		
6500-14, Rear HF Fan Module	NTK507MDE5	3
Auxiliary Shelf Equipment		
Cover Kit, Optical Shelf, R3, Left Lift-Off Hinged	NTK509CCE6	1
Filler Card		
Interface Filler Pack	NTK505YAE5	9
Shelf Processor		
6500 REL 9.32 Shelf Processor (SP-2 FOR 6500-7/14) Kit	NTZF03JY	2
Access Panels		
Access Panel, CNVD (SONET)	NTK505MBE5	1
Power Input Interface		
Power Input Card 60A (Breakerless)	NTK505DAE5	2
Maintenance Interface Card		
Maintenance Interface Card 5/6	NTK505FBE5	1
Amplifier Modules		
Mid-Stage Line Amplifier 2 (EDFA Module 6)	NTK552FAE5	2
Wavelength Selective Switch		
Wavelength Selective Switch (WSS) 100GHZ W/OPM C-Band 4X1 Circuit Pack	NTK553HA	2
Optical Service Channel		
2 X Optical Service Channel	NTK554BAE5	1
Small Form Pluggables for OSC Circuit Pack (NTK554BAE5)		
Small Form Pluggables for OSC Circuit Pack (NTK554BAE5)	NTK592NGE5	2
OME Software Loads		
6500 And CPL REL 9.32 S/W DVD	NTK562JY	1
6500 NE RTUs		
OME 6500 Base RTU (Per NE)	NTK560AA	1

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REVISION OF SECTION 614
CARRIER ETHERNET PACKET-OPTICAL PLATFORM (6500)

Item Table 1 (Continued) – Ciena 6500 Carrier Ethernet Packet-Optical Platform Ethernet, I-70 and Airport Blvd

This item table includes materials for a complete Platform installation at this location.

Item Description	Item Number	Quantity
Software Tracking Certificates		
6500 REL 9.32 Certificate	NTK569JY	1
6500 Photonic RTUs		
6500 ROADM RTU (PER WSS)	NTK560FT	2
6500 Photonic RTUs (Existing)		
OME 6500 ROADM RTU	NTK560BP	2
Site Manager for 6500		
6500 REL 9.32 Site Manager RTU	NTNM34UJ	1
Optical Application Platform RTUs		
ONM Base for OME6500 14-Slot RTU RTU, ONM Base for OME6500 WSS Card	NTNM70EJ NTNM70ET	1 2
Bay Accessories		
Small Optical Installation/IRM Kit	NTK509NZE6	1
Installation Kits for Breaker Interface Panel		
2U BIP Power Lug Kit 6AWG/16MM SQ 90 Degree	NTK599ZAE6	1
AC Rectifier and Associated Items		
2U AC Rectifier ASSY, 3X 2KW Rectifier Modules, 2X 60A Breakers Cable Assembly, L6-30 NEMA 2 Pole AC Plug to Open, 30A 250V, 3 X 10AWG, 4.6M (NA)	184-0053-900 441-4085-001	1 2
Fiber Management Equipment for Photonic Deployments		
1U Fiber Management Tray	NT0H57BBE6	1
Site Dependent Material		
Installation Related Material -Deployment Services Billing	800-DEPL-IRM	1

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REVISION OF SECTION 614
CARRIER ETHERNET PACKET-OPTICAL PLATFORM (6500)

Item Table 2 – Ciena 6500 Carrier Ethernet Packet-Optical Platform, Project Network Wide

This item table includes materials for all project 6500 Carrier Ethernet Packet-Optical Platform installations. The Contractor shall include the cost of these items in an inclusive cost of all locations and not at a per unit cost.

Item Description	Item Number	Quantity
Standard Deployment Services		
Detailed Network Design	80P-DND0-000	1
Site Engineering	800-DEPL-SS	1
Installation	800-DEPL-INS	1
Project/Deploy Management	800-PRMG-DPL	1
Test Planning and Verification	800-DEPL-TPV	1
Turn-Up and Test	800-DEPL-TT	1
Test Equipment	800-TEST-EQ0	1
Circuit Provisioning	80P-CP00-000	1
Remote Design and Configuration Services		
Network Design	80P-CSSC-NCU	1
Remote Configuration Service	80P-RESC-000	1
Maintenance Services		
Global 6500 Smartsupport - 3 Years	80M-6500-SSP	1
Global 6500 Standard Hardware Repair 30-Day - 3 Years	80M-6500-HWM	1
Global 6500 Next Business Day Ship Managed Spares - 3 Years	80M-6500-NBS	1

Each Ciena 6500 Carrier Ethernet Packet-Optical Platform shall be capable of configuration in conformance with the Ciena Ethernet Design and Configuration Services per the Colorado Department of Transportation (CDOT) requirements. CDOT will configure basic IP schema for each Ciena 6500 Carrier Ethernet Packet-Optical Platform.

If field changes are made which affect the original Contractor's material order for the Ciena 6500 Carrier Ethernet Packet-Optical Platform and require any changes of the original Ethernet Router order, the Contractor shall ensure that the Ciena distributor is contacted and made aware of such changes to alleviate any possible delays in delivery and installation.

If for any reason the switch or associated materials are defective or are damaged at the time of installation by the Contractor, the item shall be removed and replaced at no additional cost to the project. Items shall also be replaced if any failures occur do to manufacture's defects, at no additional cost to the project prior to the final acceptance.

Neither the Ciena distributor nor Ciena Corporation has been involved in the design of the project network. The Contractor shall contact the Ciena distributor for equipment quotations and purchasing purposes only. The Contractor shall not contact or rely on either the Ciena distributor or Ciena for

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REVISION OF SECTION 614
CARRIER ETHERNET PACKET-OPTICAL PLATFORM (6500)

network design related questions. It is the Contractor's responsibility to provide the distributer's representative all information required pertaining to the complete network design as shown in the project plans. All questions pertaining to the network design shall be conducted through the Project Engineer for help or clarification.

When requesting quotations, the Contractor shall submit to Ciena distributor or Ciena a complete package including the following items:

1. A complete list of required equipment for purchase including materials and quantities based on the individual pay item project specifications including those stated under the Method of Measurement section of the specification to achieve a complete item(s) installation per the project plans.

2. A PDF copy of all project specifications pertaining to the material being ordered.

3. A PDF copy of all networking project plan sheets.

CONSTRUCTION REQUIREMENTS

The Contractor shall furnish the Ciena 6500 Carrier Ethernet Packet-Optical Platforms for the Communications Node Buildings and all upgrade equipment for the existing Ciena 6500 Carrier Ethernet Packet-Optical Platform locations. After the Contractor has placed the final order through the CenturyLink representative, the order will be forwarded to Ciena for staging and configuration for all Optical Platforms. Once the Optical Platform units are complete and ready to ship by Ciena, all materials will be shipped to the Colorado Transportation Management Center directly from the Ciena facility.

When all material has arrived at the CTMC, CDOT personnel and Ciena representatives will schedule and conduct the installations. While the CDOT and Ciena personnel install the Optical Platforms, the Contractor shall continue installation of the Ethernet Switches being purchased and installed as part of this project. This includes the Ciena 3930 Ethernet Switches, Ciena 3931 Ethernet Switches, Ciena 5142 Ethernet Switch, Ciena 5150 Ethernet Switches, and the Ciena 5160 Ethernet Switches.

Carrier Ethernet Packet-Optical Platform shall include Ciena 6500 Carrier Ethernet Packet-Optical Platforms furnished and accepted for both the Communications Node Buildings and all Ciena

6500 Carrier Ethernet Packet-Optical Platform upgrade equipment to be installed at the existing Optical Platform locations.

This work includes all items shown on Tables 1, 2, 3, 4 and 5; staging and configuration of each Ciena 6500 Carrier Ethernet Packet-Optical Platform. Work includes all Cat-6 Ethernet cables and single mode fiber optic pre-connectorized patch cables.

REVISION OF SECTION 614
ETHERNET ROUTER (5150)

Section 614 of the Standard Specifications is hereby revised for this Project to include the following:

DESCRIPTION

For this Project, Ethernet Router shall be a Ciena 5150 Carrier Ethernet Service Aggregation Switch (SAS), utilizing 1 Gigabit small form-factor pluggable (SFP) and 10 Gigabit small form-factor pluggable (XFP) optic modules, installed in the regeneration node buildings/traffic management system buildings to bi-directionally transport Ethernet data to and from Ciena 3930 Carrier Ethernet Service Delivery Switches.

The Ethernet switch shall have forty eight 100M/1 Gigabit SFP ports. The switch shall also have four 10 gigabit ports. 1 gigabit ports and 10 gigabit ports shall have SFP and XFP optic modules, as described in the Project Specifications. Additionally, a SFP + optic module, if required for connection between a Ciena 5160 and the proposed Ciena 5150 shall also be provided.

A single mode, 9/125 um optical attenuator to match the wavelength of the SFP and XFP optic modules shall be included and installed in the receive port of the SFP and XFP on the Ciena 5150 Ethernet Switch, unless otherwise specified by the Engineer. Optical attenuators shall be provided and paid for as part of the Ethernet Router item.

MATERIALS

The Ethernet switch shall be configured with 48 100M/1000M SFP Ethernet ports two 10 Gigabit Module Slots and two 10 Gigabit XFP ports per module.

The Contractor shall furnish and install the Ethernet switch and associated items shown in Item Table A below. The Contractor shall also furnish the Ethernet switch software and maintenance licenses show in Item Tables B and C. Tables A, B and C describe items to be included with a single 5150 Carrier Ethernet Service Aggregation Switch.

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REVISION OF SECTION 614
ETHERNET ROUTER (5150)

Table A – Ciena 5150 Carrier Ethernet SAS Switch, Hardware Description

Item Description	Item Number	Quantity
CN 5150,(48)100/1000M SFP,(2)SLOTS 10G DUAL XFP MODULE,EXT. TEMP,(2)SLOTS AC OR DC PLUG POWER SUPPLY	170-5150-900	1
AC PLUGGABLE POWER SUPPLY,CN 5150	170-0100-902	2
AC POWER CORD, IEC C13, 5-15P,125VAC,10A, 10FT	170-0044-900	2
CONSOLE SERIAL CABLE,RJ45 EIA TO DB9 FEMALE FOR DIRECT CONNECTION TO LAPTOP,6FT	170-0063-900	1
10GIG, MM XFP, LC CONNECTOR, 300 METERS, 850 NM (for connecting to Ciena 5160 and/or Ciena 6500 in same node building)	XCVR-000Z85	As required
10GIG, SM XFP, LC CONNECTOR, 40 KM, 1550 NM, EXT TEMP	XCVR-A40V55	As required
10GIG,SM XFP,LC CONNECTOR, 80KM,1550 NM,EXT TEMP	XCVR-A80V55	As Required
CN 5150,(2)10GIG XFP MODULE	170-5101-900	1
10/100/1000M, SFP TRANSCEIVER, RJ45 CONNECTOR, SGMII, 100 METERS, EXT TEMP	XCVR-A00CRJ	As Required
100M/1GIG, SM SFP OPTIC, LC CONNECTOR, 10 KM, 1310 NM, EXT TEMP	XCVR-A10Y31	As Required
100M/1GIG, SM SFP OPTIC, LC CONNECTOR, 40 KM, 1310 NM, EXT TEMP	XCVR-A40Y31	As Required
10GIG, SM SFP+, LC CONNECTOR, 40 KM, 1550 NM, EXT TEMP (for existing or proposed Ciena 5160)	XCVR-S40V55	As Required

Table B – Ciena 5150 Carrier Ethernet SAS Switch, Software Description

Item Description	Item Number	Quantity
SAOS ADVANCED ETHERNET PERPETUAL SOFTWARE LICENSE FOR 48-PORT CN 5150 CHASSIS	170-0205-904	1
SAOS ADVANCED OAM PERPETUAL SOFTWARE LICENSE FOR 48-PORT CN 5150 CHASSIS	170-0206-904	1
SAOS ADVANCED ETHERNET PERPETUAL SOFTWARE LICENSE FOR CN 5150 (2) 10 GIG MODULE	170-0205-905	1
SAOS ADVANCED OAM PERPETUAL SOFTWARE LICENSE FOR CN 5150 (2) 10 GIG MODULE	170-0206-905	1
SAOS ADVANCED SECURITY PERPETUAL SOFTWARE LICENSE FOR USE WITH SAOS 6.X	170-0204-900	1
SAOS ADVANCED MPLS APPLICATION PERPETUAL SOFTWARE LICENSE FOR CN 5150 SYSTEM	170-0203-904	1
ESM CARRIER ED RIGHT TO MANAGE PERPETUAL SOFTWARE LICENSE FOR 48-PORT CN 5150 CHASSIS	170-0301-904	1
ESM CARRIER ED RIGHT TO MANAGE PERPETUAL SOFTWARE LICENSE FOR CN 5150 (2) 10GIG MODULE	170-0301-905	1

Table C – Ciena 5150 Carrier Ethernet SAS Switch, Maintenance License

Item Description	Item Number	Quantity
GLOBAL 5150 SMARTSUPPORT - 3 YEARS	80M-5150-SSP	1
GLOBAL 5150 STANDARD HARDWARE REPAIR 10-DAY - 3 YEARS	80M-5150-HWM	1
GLOBAL 5150 NEXT BUSINESS DAY SHIP MANAGED SPARES - 3 YEARS	80M-5150-NBS	1

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REVISION OF SECTION 614
ETHERNET ROUTER (5150)

All associated hardware and materials not listed in the item tables are considered subsidiary and required for a complete installation and shall be included as part of the work.

Each Ethernet Router shall be capable of G.8032 ring protection configuration in conformance with the Ciena Ethernet Design and Configuration Services per the Colorado Department of Transportation (CDOT) requirements. CDOT will configure basic IP schema for each Ethernet Router.

Final configuration for data transport and G.8032 configuration will be conducted by CDOT personnel after network burn in.

If field changes are made which affect the original Contractor's material order for the Ethernet switches and require any changes of the original Ethernet Router order, the Contractor shall ensure that the Ciena distributor is contacted and made aware of such changes to alleviate any possible delays in delivery and installation.

If for any reason the switch or associated materials are defective or are damaged at the time of installation, the item shall be removed and replaced by the Contractor at no additional cost to the Project. Items shall also be replaced if there are any failures, including due to manufacture's defects. These replacements shall be included with the work at no additional cost to the Project.

The Contractor shall contact the Ciena distributor for equipment quotations and purchasing purposes only. It is the Contractor's responsibility to provide the distributer's representative all information required pertaining to the complete network design.

When requesting quotations, the Contractor shall submit to Ciena distributor or Ciena a complete package including the following items:

1. A complete list of required equipment for purchase including materials and quantities based on the individual item listed in the Project specifications. This includes items to achieve work completed and installed per the Project plans.

2. A PDF copy of all Project specifications pertaining to the material being ordered.

3. A PDF copy of all networking Project plan sheets.

CONSTRUCTION REQUIREMENTS

The 5150 Ethernet switch shall be installed in traffic management system buildings in the quantities required for this Project and will be connected via the fiber optic backbone to Ciena 3930 SDS at communication cabinet field device locations. Each Ethernet Router shall have a SFP optic module matching those in the field Ethernet switches. The 5150 SAS Ethernet switch shall also be connected to existing or proposed Ciena 5150 and Ciena 5160. This connection shall be made via the backbone fiber as designated on the Plans and described herein.

Spare ports in existing Ciena 5150 switches may not be used for any purposed on this project.

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REVISION OF SECTION 614
ETHERNET ROUTER (5150)

The Contractor shall provide the number of Ciena 5150 switches needed to meet the following requirements:

1. The Ciena 5150 switches shall accommodate connections to all field switches installed on the Project; and
2. Out of the 48 100M/1G SFP ports available on a new Ciena 5150, there shall be a minimum of 29 ports that remain as spares for CDOT's future use. If a minimum of 29 spare 100M/1G SFP ports are not available at each node building, an additional Ciena 5150 shall be provided to meet this requirement. Spare ports in existing Ciena 5150 switches cannot be used to fulfill this requirement..

When using CWDM, the Contractor shall install single mode, bend insensitive, pre-connectorized duplex patch cables with a polyurethane jacket for connection from the CWDM mux/demux to the individual CWDM 100M/1G SFP modules in the Ciena 5150. The Contractor shall also install single mode, bend insensitive, pre-connectorized duplex patch cables with a polyurethane jacket for connection from the fiber optic termination panel to the XFP optic modules. Connectors for the patch cable shall be LC for the SFP, XFP and SFP+ optic modules. The Contractor shall verify the required connectors for each patch cable.

Ethernet Router shall include SFP optic modules, XFP optic modules, optical attenuator, power supplies, power cables, licenses, switch software, maintenance license, wiring, patch cables, and documentation.

REVISION OF SECTION 614
ETHERNET ROUTER (5160)

Section 614 of the Standard Specifications are hereby revised for this Project to include the following:

DESCRIPTION

1. For this Project, Ethernet Router shall be a Ciena 5160 Carrier Ethernet Service Aggregation Switch, utilizing Enhanced Small Form-factor Pluggable (SFP+) optic modules, installed in node buildings to aggregate local and remote Ciena 5150 Carrier Ethernet Service Aggregation Switches at 10 Gigabits per second (Gbps). The Ciena 5160 Carrier Ethernet Service Aggregation Switch shall interface to Ciena 6500 Packet-Optical Platform Switch at 10 Gbps, unless otherwise specified by CDOT.

2. The Ciena 5160 Carrier Ethernet Service Aggregation Switch shall have the ability to accept up to a maximum of twenty-four (24) 1 Gbps or 10 Gbps multi-rate SFP+ ports. All 10 Gigabit Small Form-factor Pluggable (XFP) optic modules for Ciena 5150s that will interface with the Ciena 5160 as part of this Project shall be provided by the Contractor. Additionally, the SFP+ optic module for the Ciena 5160 that is needed to interface with both the Ciena 5150 and 6500 shall also be provided by the Contractor.

3. A single mode, 9/125um optical attenuator to match the wavelength of the XFP optic modules shall be included and installed in the receive port of the fiber optic termination panel that is connected to the XFP in each remote Ciena 5150 (located in Node 2 and Port of Entry communication node buildings) interfacing with the Ciena 5160, unless otherwise required by the Engineer. Single mode, 9/125um optical attenuators to match the wavelength of the SFP+ optic module shall be included and installed in the receive port of the fiber optic termination panel that is connected to the SFP+ on the Ciena 5160, unless otherwise required by the Engineer. Optical attenuators shall also be provided by the Contractor

MATERIALS

The Ciena 5160 Carrier Ethernet Service Aggregation Switch shall be configured with twenty-four (24) 10G SFP+ ports, one (1) 10/100/1000M RJ-45 management port, one (1) console port (RJ-45, EIA-561), sixteen (16) external alarm inputs, one (1) RJ-45 sync input/output port and two (2) SMB sync input/output ports.

The Contractor shall furnish and install the Ciena 5160 Carrier Ethernet Service Aggregation Switch and associated items shown in Item Table A below. The Contractor shall also furnish the Ethernet switch software and maintenance licenses shown in Item Tables B and C. Item Tables A, B and C describe items to be included with a single 5160 Carrier Ethernet Service Aggregation Switch.

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REVISION OF SECTION 614
ETHERNET ROUTER (5160)

Table A – Ciena 5160 Carrier Ethernet SAS Switch, Hardware Description

Item Description	Item Number	Quantity
5160,(24)1G/10G SFP+, EXT. TEMP, (2) SLOTS AC OR DC PLUG POWER SUPPLY	170-5160-900	1
5160, AC PLUGGABLE POWER SUPPLY, WIDE RANGE 120/240V	170-0070-900	2
AC POWER CORD, IEC C13, 5-15P,125 VAC,10 A, 10 FT	170-0044-900	2
DB-9F TO EIA-RJ45M STANDARD, 6 FT SERIAL CONSOLE CABLE	170-0063-900	1
10GIG, MM XFP OPTIC, LC CONNECTOR, 300 METERS, 850 NM, EXTENDED TEMPERATURE (FOR 5150s ONLY)	XCVR-A00Z85	AS REQUIRED ON PLANS
10GIG, MM SFP+, LC CONNECTOR, 300 METERS, 850 NM, EXTENDED TEMPERATURE	XCVR-S00Z85	AS REQUIRED ON PLANS
10GIG, SM SFP+, LC CONNECTOR, 80 KM, 1550 NM, EXTENDED TEMPERATURE	XCVR-S80V55	AS REQUIRED ON PLANS
SFP+, 10GE/FC1200, 850 NM (FOR 6500 ONLY)*	160-9111-900*	AS REQUIRED

* Assumes 5160 will interface to a 4x10G OTR card (NTK530QA) in existing 6500; Contractor to confirm with CDOT.

Table B – Ciena 5160 Carrier Ethernet SAS Switch, Software Description

Item Description	Item Number	Quantity
SAOS ADVANCED ETHERNET PERPETUAL SOFTWARE LICENSE FOR 5160 SYSTEM	S70-0017-900	1
SAOS ADVANCED OAM PERPETUAL SOFTWARE LICENSE FOR 5160 SYSTEM	S70-0017-901	1
SAOS ADVANCED SECURITY PERPETUAL SOFTWARE LICENSE FOR USE WITH SAOS 6.X	170-0204-900	1
SAOS ADVANCED MPLS APPLICATION PERPETUAL SOFTWARE LICENSE FOR 5160 SYSTEM	S70-0017-903	1
ESM CARRIER ED RIGHT TO MANAGE PERPETUAL SOFTWARE LICENSE FOR 5160 SYSTEM	S70-0018-900	1

Table C – Ciena 5160 Carrier Ethernet SAS Switch, Maintenance License

Item Description	Item Number	Quantity
GLOBAL 5160 SMARTSUPPORT - 3 YEARS	80M-5160-SSP	1
GLOBAL 5160 STANDARD HARDWARE REPAIR 10-DAY - 3 YEARS	80M-5160-HWM	1
GLOBAL 5160 NEXT BUSINESS DAY SHIP MANAGED SPARES - 3 YEARS	80M-5160-NBS	1

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REVISION OF SECTION 614
ETHERNET ROUTER (5160)

All associated hardware and materials not listed in the item tables are considered subsidiary and required for a complete installation and shall be included as part of the work.

Final configuration including all IP schema design for data transport will be conducted by CDOT personnel after installation.

If field changes are made which affect the original Contractor's material order for the Ethernet Router and require any reconfiguration of the original Ethernet switch material orders, the Contractor shall ensure that the Ciena distributor is contacted and made aware of such changes to alleviate any possible delays in delivery and installation. If for any reason the router or associated materials are defective or are damaged at the time of installation by either the Contractor or Ciena, the item shall be removed and replaced at no additional cost to the Project. Items shall also be replaced if any failures occur due to manufacturer's defects, at no additional cost to the Project, prior to the final acceptance.

Neither the Ciena distributor nor Ciena Corporation have been involved in the design of the Project corridor network. The Contractor shall contact the CenturyLink representative for equipment quotations and purchasing purposes only. The Contractor shall not contact or rely on either Ciena distributor or Ciena for network design related questions.

When requesting quotations, the Contractor shall submit to Ciena distributor or Ciena a complete package including the following items:

a) A complete list of required equipment for purchase including materials and quantities based on the individual Project specifications to achieve a complete item(s) installation.
b) A PDF copy of all Project specifications pertaining to the material being ordered.
c) A PDF copy of all networking Project plan sheets.

It is the Contractor's responsibility to provide the distributer's representative all information required pertaining to the complete network design. During the Project, the Ciena distributor or Ciena Corporation is not responsible for any type of network design aide. All questions pertaining to the network design shall be conducted through the Department for help or clarification.

CONSTRUCTION REQUIREMENTS

The 5160 SAS Ethernet switch shall be installed in the communications node buildings as require and will be connected via fiber to local and remote 5150s, unless otherwise required by CDOT. The 5160 SAS Ethernet switch shall also be connected to the Ciena 6500, unless otherwise required by CDOT.

For 5160 connection to remote 5150s, the Contractor shall install single mode, bend insensitive, pre-connectorized duplex patch cables with a polyurethane jacket for connection from the fiber optic termination panel to the SFP+ optic modules in the Ciena 5160. The Contractor shall also install multi-mode, bend insensitive, pre-connectorized duplex patch cables with a polyurethane jacket for connection from each local 5150 XFP optic module to the SFP+ optic modules in the Ciena 5160 located in the same communications node building. Connectors for the patch cable shall be LC for the XFP and SFP+ optic modules and LC for the fiber optic termination panel.

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REVISION OF SECTION 614
ETHERNET ROUTER (5160)

Ethernet Router 5160 shall include a Ciena 5160 Carrier Ethernet SAS installed and accepted. Also included shall be 10Gig SFP+ multimode optics, 10Gig SFP+ single mode optics, 10Gig XFP multimode optics (for local Ciena 5150 switches), 10 Gig XFP single mode optics (for remote Ciena 5150 switches), 10Gig SFP+ multimode optics (for local Ciena 6500 switch), optical attenuators, power supplies, power cords, console cable, switch operating system, software licenses, maintenance services, basic configuration, wiring, single mode fiber optic pre-connectorized patch cables, multi-mode fiber optic pre-connectorized patch cables, documentation, and testing by the Ciena representative. Ciena representative shall be on-site for testing.

REVISION OF SECTION 614
ETHERNET SWITCH (3930)

Section 614 of the Standard Specifications is hereby revised for this Project as follows:

DESCRIPTION

For this Project Ethernet Switch shall be a Ciena 3930 Carrier Ethernet Service Delivery Switch (SDS) for installation in individual Intelligent Transportation Systems (ITS) device communication cabinets and/or variable message sign cabinets to transport Ethernet data to and from ITS Node Buildings and roadway ITS devices as shown in the Project plans. All Ethernet switches shall be manufactured by Ciena.

The Ethernet switch shall utilize Coarse Wavelength Division Multiplexing (CWDM) and Small Form-factor Pluggable (SFP) optic modules. Each switch shall be provided with both a CWDM SFP optic module and a 1310 nm SFP optic module where a two switch per wavelength deployment is utilized (typical design). The Contractor is advised that in certain cases there are more than two switches per wavelength and when this occurs, the switch or switches in the middle shall utilize two 1310 nm SFP optic modules. Optic modules shall be provided as described in the Project Specifications, 614 – CWDM SFP and 614 – Small Form-Factor Pluggable – 1310 nm SFP as part of this specification package. All optic modules for the Ciena 3930 shall a part of the Ethernet switch item.

The Ethernet switches shall interface with Ciena 5150 Ethernet aggregation switches located in regeneration node buildings along the Project corridor.

A single mode, 9/125um CWDM wavelength independent attenuator to match the wavelength of the SFP optic modules shall be included and installed in the communications cabinet termination patch panel. Optical attenuators shall be provided as described in the Project Specification, 614 - Coarse Wavelength Division Multiplexing Attenuator.

MATERIALS

The Ethernet switch shall be configured with two (2) 1GIG/10GIG SFP+ ports, four (4) 100M/1000M SFP ports and two (2) 10/100/1000M RJ-45 Ethernet ports. User Network Interface (UNI) ports are not required as part of the Ethernet switch.

The Contractor shall furnish and install the Ethernet switch and associated items shown in Item Table A below. The Contractor shall also furnish the Ethernet switch software and maintenance licenses show in Item Tables B and C. Tables A, B and C describe items for a single Ciena 3930 SDS Ethernet switch.

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REVISION OF SECTION 614
ETHERNET SWITCH (3930)

Table A – Ciena 3930 SDS Ethernet Switch, Typical Hardware Description

Item Description	Item Number	Quantity
3930, (4) 100/1000M SFP, (2) 100/1000M RJ-45, (2) 1G/10G SFP+, EXT.TEMP, (2)SLOTS AC/DC POWER SUPPLY	170-3930-900	1
3930, AC PLUGGABLE POWER SUPPLY, WIDE RANGE 120/240V	170-0014-900	2
AC POWER CORD, IEC C13, NORTH AMERICA	170-0019-902	2
10/100/1000M, SFP TRANSCEIVER, RJ45 CONNECTOR, SGMII, 100 METERS, EXTENDED TEMPERATURE	XCR-B00CRJ	2
100M/1GIG, SM SFP OPTIC, LC CONNECTOR, 10 KM, 1310 NM, EXTENDED TEMPERATURE (refer to 614 – Small Form-factor Pluggable SFP)	XCVR-A10Y31	As required per Plans
100M/1GIG, SM SFP OPTIC, LC CONNECTOR, 80 KM, 1**xx**0 NM,EXTENDED TEMPERATURE (refer to 614 – CWDM SFP) (for Ciena 3930 and Ciena 5150 switches)	XCVR-A80D**xx**	As required per Plans

xx – values range from 43 to 61 based on required CWDM wavelengths (1430 nm to 1610 nm)

Table B – Ciena 3930 SDS Ethernet Switch, Typical Software Description

Item Description	Item Number	Quantity
SAOS ADVANCED ETHERNET PERPETUAL SOFTWARE LICENCE FOR 3930	S70-0001-900	1
SAOS ADVANCED OAM PERPETUAL SOFTWARE LICENCE FOR 3930	S70-0001-901	1
SAOS ADVANCED SECURITY PERPETUAL SOFTWARE LICENCE FOR USE WITH SAOS 6.X	170-0204-900	1
SAOS ADVANCED MPLS APPLICATION PERPETUAL SOFTWARE LICENSE FOR 3930	S70-0001-903	1
ESM CARRIER ED RIGHT TO MANAGE PERPETUAL SOFTWARE LICENSE FOR 3930	S70-0005-900	1

Table C – Ciena 3930 SDS Ethernet Switch, Typical Maintenance License

Item Description	Item Number	Quantity
SMARTSUPPORT, 3930, 3 YEARS	80M-3930-SSP	1
HARDWARE REPAIR SERVICE 10 DAY MAINTENANCE, 3930, 1 YEAR	80M-3930-HWM	1
NEXT BUSINESS DAY MANAGED SPARES, CN 3930, 1 YEAR	80M-3930-NBS	1

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REVISION OF SECTION 614
ETHERNET SWITCH (3930)

Matching CWDM SFP optic modules shall also be provided for Ciena 5150 Ethernet aggregation switches in each of the regeneration node buildings to which the Ciena 3930 switches communicate. Quantities for these Ciena 5150 Ethernet aggregation switch CWDM SFP optic modules shall be identified in material tables.

Each Ethernet Switch shall be furnished and installed with a G.8032 ring protection configuration in conformance with Ciena's Ethernet Design and Configuration Services per the Colorado Department of Transportation requirements either prior to installation or at the individual installation sites.

Preliminary configuration including all IP schema design for data transport will be conducted by CDOT personnel prior to installation. All final configurations and G.8032 configuration shall also be conducted by CDOT personnel.

If field changes are made which affect the original Contractor's material order for the Ethernet switches and require any reconfiguration of the original Ethernet switch material orders, the Contractor shall ensure that the Ciena distributor is contacted and made aware of such changes to alleviate any possible delays in delivery and installation. If for any reason the switch or associated materials are defective or are damaged at the time of installation by either the Contractor or by Ciena, the item shall be removed and replaced at no additional to the Project. Items shall also be replaced if any failures occur due to manufacturer's defects, at no additional cost to the Project prior to the final acceptance.

Neither Ciena distributor nor Ciena Corporation has been involved in the design of the Project network. The Contractor shall contact the Ciena distributor for equipment quotations and purchasing purposes only. The Contractor shall not contact or rely on either the Ciena distributor or Ciena for network design related questions.

When requesting quotations, the Contractor shall submit to the Ciena distributor a complete package including the following items:

1. A complete list of required equipment for purchase including materials and quantities based on the individual item listed in the Project specifications including those stated work items needed to achieve to complete the work and installation per the Project plans.
2. A PDF copy of all Project specifications pertaining to the material being ordered.
3. A PDF copy of all networking Project plan sheets.

It is the Contractor's responsibility to provide the distributer's representative all information required pertaining to the complete network design as shown in the Project plans. During the bidding process, the Ciena distributor or Ciena Corporation is not responsible for any type of network design aide. All questions pertaining to the network design shall be conducted through the Department for help or clarification.

CONSTRUCTION REQUIREMENTS

The 3930 SDS Ethernet switch will be installed in a communications cabinet or variable message sign and connected via the fiber optic backbone to a communications node building in a protected ring design. Each switch shall normally have both a CWDM SFP optic module and a 1310nm SFP optic module,

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REVISION OF SECTION 614
ETHERNET SWITCH (3930)

except as previously noted where there are more than two switches per wavelength. Each switch shall be configured as part of creating a single carrier Ethernet diverse path sub-ring.

For connection of the switch to the optical fiber network, one (1) lateral fiber optic cable shall be terminated and patch cables shall be installed and connected to the optical ports of the switch. A total of four (4) lateral fiber strands shall be used for data communications to the switch. Two (2) lateral fiber strands shall be used for communications connecting the SFP optics carrying CWDM traffic and two (2) lateral fiber strands shall be used for communications connecting the 1310 nm SFP optics, except as noted where there are more than two switches per wavelength.

Additional splicing is required for the CWDM optical filters at each Ciena 3930 location. The CWDM optical filters shall be used to split a single CWDM wavelength from the multiple wavelengths being transmitted along the fiber strands, including passing a 1310 nm wavelength between Ciena 3930 switch pairs. See Plan sheets for splicing details and 614 – Single Wavelength CWDM Optical Filter.

The Contractor shall provide single mode, bend insensitive, pre-connectorized duplex patch cables with a polyurethane jacket for connection from the coarse wavelength division multiplexing SFP optic module and the 1310 nm SFP optic module. Connectors for the patch cable shall be LC on the Ethernet switch end and ST on the termination end. For Ethernet switches in node buildings, if applicable, proposed termination panels may use LC connectors to accommodate

The high termination requirements of the proposed fiber optic cable, accordingly LC-to-LC patch cables may be utilized at these locations.
The patch cable shall be of sufficient length to span from the termination patch panel to the Ethernet switch SFP ports with a maximum of two (2) feet of slack. They shall be installed in a manner which will not interfere with internal device equipment in the switch enclosure and will include cable management so as not to interfere with future maintenance within the enclosure.

For installations in variable message signs, the Contractor shall install an aluminum backplane on the internal structural supports of the sign housing. It shall be mounted in a location which will not interfere with internal equipment and future maintenance of the variable message sign electronics and cabling. The Ethernet switch shall not be mounted directly on to the variable message sign cabinet wall or sign support.

All material required for mounting of the Ethernet switch in the variable message sign cabinet shall be included in the price of the Ethernet switch.

A field site survey for final placement of the Ethernet switch in the variable message sign cabinet shall be conducted prior to installation.

If required the Contractor shall arrange to provide for a certified Ciena representative either on site or via remote access through the Colorado Transportation Management Center network to aid in the configuration and installation of the Ethernet switch.

See the Revision of Section 614 – Testing and Integration for additional requirements.

Ethernet Switch 3930 shall include Ciena 3930 Carrier Ethernet Service Delivery Switches installed and accepted. Work includes CWDM SFP optic module (for both Ciena 3930 and Ciena 5150 switches), 1310 nm SFP optic module, RJ-45 SFP modules, optical attenuator, power supplies, power

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REVISION OF SECTION 614
ETHERNET SWITCH (3930)

cables, CAT6 Ethernet cables, single mode fiber optic pre-connectorized bend insensitive patch cables, material for the Ethernet switch attachment to the interior of the variable message sign, licenses, switch operating system and software, wiring, documentation, and configuration by the Ciena representative. Work includes arranging a Ciena representative to be either on-site or via remote access.

REVISION OF SECTION 614
ETHERNET SWITCH (3931)

Section 614 of the Standard Specifications is hereby revised for this project as follows:

DESCRIPTION

For this project, at locations where installation of a Ciena 3930 Carrier Ethernet Service Delivery Switch (SDS) is infeasible due to the size of the switch, Ethernet Switch shall be a Ciena 3931 Carrier Ethernet SDS integrated in a weather proof enclosure and shall be installed on support posts, in cabinets, or attached to the side of cabinets, to transport Ethernet data to and from roadway ITS devices on this project. All Ethernet switches shall be manufactured by Ciena.

The Ethernet switch shall utilize Coarse Wavelength Division Multiplexing (CWDM) and Small Form-factor Pluggable (SFP) optic modules. Each switch shall be provided with both a CWDM SFP optic module and a 1310 nm SFP optic module where a two switch per wavelength deployment is utilized (typical design). The Contractor is advised that in certain cases there are more than two switches per wavelength and when this occurs, the switch or switches in the middle shall utilize two 1310 nm SFP optic modules. Optic modules shall be provided as described in the Project Specifications, 614 – CWDM SFP and 614 – Small Form-Factor Pluggable – 1310 nm SFP as part of this specification package. All optic modules for the Ciena 3931 shall be paid for as part of the Ethernet switch pay item.

The Ethernet switches shall interface with Ciena 5150 Ethernet aggregation switches located in regeneration node buildings or the CTMC.

A single mode, 9/125um CWDM wavelength independent attenuator to match the wavelength of the SFP optic modules shall be included and installed in the communications cabinet termination patch panel. Optical attenuators shall be provided as described in the Project Specification, 614 - Coarse Wavelength Division Multiplexing Attenuator.

MATERIALS

The Ethernet switch shall be configured with two (2) 1GIG/10GIG SFP+ ports, four (4) 100M/1000M SFP ports and two (2) 10/100/1000M RJ-45 Ethernet ports. User Network Interface (UNI) ports are not required as part of the Ethernet switch.

The Contractor shall furnish and install the Ethernet switch and associated items shown in Item Table A below. The Contractor shall also furnish the Ethernet switch software and maintenance licenses show in Item Tables B and C. Tables A, B and C describe items for a single Ciena 3931 SDS Ethernet switch.

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REVISION OF SECTION 614
ETHERNET SWITCH (3931)

Item Table A – Ciena 3931 SDS Ethernet Switch, Typical Hardware Description

Item Description	Item Number	Quantity
3931, Pluggable System Module, (2) 1/10G SFP+, (4) 100/1000 SFP, (4) 10/100/1000M RJ-45	170-3931-900	1
3931, Enclosure For Pluggable System Module, (2) Slot AC Pluggable Power Supply	120-3931-900	1
Cable Entry Seal, Outside Plant Fiber, ½ Inch	170-0074-900	1
CN 3911, (3) Band Clamp UAM Pole Mount Kit	MISC-BCPM01	1
CN 3911, UAM Pole Mount Kit	MISC-MKPM01	1
AC Power Cord, IEC C15, 10FT, Outdoor, North America	170-0019-902	2
3931, AC Pluggable Power Supply, Wide Range 120/240V	170-0042-900	2
10/100/1000, SFP Transceiver, RJ-45 Connector, SGMII, 100 Meters, Extended Temperature	XCR-B00CRJ	2
100M/1GIG, SM SFP OPTIC, LC Connector, 10 KM, 1310 NM Extended Temperature	XCVR-A10Y31	As Required
100M/1GIG, SM SFP OPTIC, LC Connector, 80 KM, 1**xx**0 NM Extended Temperature	XCVR-A80D**xx**	As Required

xx – values range from 43 to 61 based on required CWDM wavelengths (1430 nm to 1610 nm)

Item Table B – Ciena 3931 SDS Ethernet Switch, Typical Software Description

Item Description	Item Number	Quantity
SAOS Advanced Ethernet Perpetual Software License for 3931	S70-0006-900	1
SAOS Advanced OAM Perpetual Software License for 3931	S70-0006-901	1
SAOS Advanced Security Perpetual Software License for Use with SAOS 6.X	170-0204-900	1
SAOS Advanced MPLS Application Perpetual Software License for 3931	S70-0006-903	1
ESM Carrier ED Right to Manage Perpetual Software License for 3931	S70-0007-900	1

Item Table C – Ciena 3931 SDS Ethernet Switch, Typical Maintenance License

Item Description	Item Number	Quantity
Smartsupport, 3931, 3 Years	80M-3931-SSP	1
Hardware Repair Service 10 Day Maintenance, 3931, 1 Year	80M-3931-HWM	1
Next Business Day Managed Spares, CN 3931, 1 Year	80M-3931-NBS	1

Matching CWDM SFP optic modules shall also be provided for Ciena 5150 Ethernet aggregation switches in each of the regeneration node buildings to which the Ciena 3931 switches communicate. Quantities for these Ciena 5150 Ethernet aggregation switch CWDM SFP optic modules shall be identified in material tables.

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REVISION OF SECTION 614
ETHERNET SWITCH (3931)

Each Ethernet Switch shall be furnished and installed with a G.8032 ring protection configuration in conformance with Ciena's Ethernet Design and Configuration Services per the Colorado Department of Transportation requirements either prior to installation or at the individual installation sites.

Preliminary configuration including all IP schema design for data transport will be conducted by CDOT personnel prior to installation. All final configurations and G.8032 configuration shall also be conducted by CDOT personnel.

If field changes are made which affect the original Contractor's material order for the Ethernet switches and require any reconfiguration of the original Ethernet switch material orders, the Contractor shall ensure that the Ciena distributor is contacted and made aware of such changes to alleviate any possible delays in delivery and installation. If for any reason the switch or associated materials are defective or are damaged at the time of installation by either the Contractor or by Ciena, the item shall be removed and replaced at no additional cost to the project. Items shall also be replaced if any failures occur due to manufacturer's defects, at no additional cost to the project prior to the final acceptance.

Neither Ciena distributor nor Ciena Corporation has been involved in the design of the project network. The Contractor shall contact the Ciena distributor for equipment quotations and purchasing purposes only. The Contractor shall not contact or rely on either the Ciena distributor or Ciena for network design related questions.

When requesting quotations, the Contractor shall submit to the Ciena distributor a complete package including the following items:

1. A complete list of required equipment for purchase including materials and quantities based on the individual pay item project specifications including those stated under the Method of Measurement section of the specification to achieve a complete item(s) installation per the project plans.

2. A PDF copy of all project specifications pertaining to the material being ordered.

3. A PDF copy of all networking project plan sheets.

It is the Contractor's responsibility to provide the distributer's representative all information required pertaining to the complete network design as shown in the project plans. During the bidding process, the Ciena distributor or Ciena Corporation is not responsible for any type of network design aide. All questions pertaining to the network design shall be conducted through the Department for help or clarification.

CONSTRUCTION REQUIREMENTS

The 3931 SDS Ethernet switch shall be installed on device support posts and connected via the fiber optic backbone to a communications node building in a protected ring design. Each switch shall normally have both a CWDM SFP optic module and a 1310nm SFP optic module, except as previously noted where there are more than two switches per wavelength. Each switch shall be configured as part of creating a single carrier Ethernet diverse path sub-ring.

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REVISION OF SECTION 614
ETHERNET SWITCH (3931)

For connection of the switch to the optical fiber network, one (1) lateral fiber optic cable shall be terminated and patch cables shall be installed and connected to the optical ports of the switch. A total of four (4) lateral fiber strands shall be used for data communications to the switch. Two (2) lateral fiber strands shall be used for communications connecting the SFP optics carrying CWDM traffic and two (2) lateral fiber strands shall be used for communications connecting the 1310 nm SFP optics, except as noted where there are more than two switches per wavelength.

Additional splicing is required for the CWDM optical filters at each Ciena 3931 location. The CWDM optical filters shall be used to split a single CWDM wavelength from the multiple wavelengths being transmitted along the fiber strands, including passing a 1310 nm wavelength between Ciena 3931 switch pairs. See 614 – Single Wavelength CWDM Optical Filter.

The Contractor shall provide single mode, bend insensitive, pre-connectorized duplex patch cables with a polyurethane jacket for connection from the coarse wavelength division multiplexing SFP optic module and the 1310 nm SFP optic module. Connectors for the patch cable shall be LC on the Ethernet switch end and ST on the termination end. For Ethernet switches in node buildings, if applicable, proposed termination panels may use LC connectors to accommodate

The high termination requirements of the proposed fiber optic cable, accordingly LC-to-LC patch cables may be utilized at these locations.

The patch cable shall be of sufficient length to span from the termination patch panel to the Ethernet switch SFP ports with a maximum of two (2) feet of slack. They shall be installed in a manner which will not interfere with internal device equipment in the switch enclosure and will include cable management so as not to interfere with future maintenance within the enclosure.

Two flexible liquid tight metal conduits shall be installed from the switch enclosure to the underside of the communications cabinet for electrical power cabling, single mode patch cables and Ethernet CAT6 communications cabling.

If required the Contractor shall arrange to provide for a certified Ciena representative either on site or via remote access through the Colorado Transportation Management Center network to aid in the configuration and installation of the Ethernet switch.

See project specific Testing and Integration for additional requirements.

Ethernet Switch 3931 shall include Ciena 3931 Carrier Ethernet service delivery switches installed and accepted for a complete installation. Also included shall be CWDM SFP optic module (for both Ciena 3931 and Ciena 5150 switches), 1310 nm SFP optic module, RJ-45 SFP modules, optical attenuator, power supplies, power cables, CAT6 Ethernet cables, single mode fiber optic pre-connectorized bend insensitive patch cables, material for the Ethernet switch attachment to the interior of the variable message sign, licenses, switch operating system and software, wiring, documentation, and configuration by the Ciena representative. Work includes arranging for a Ciena representative to be either on-site or via remote access.

REVISION OF SECTION 614
COARSE WAVELENGTH DIVISION MULTIPLEXING SFP

Section 614 of the Standard Specifications is hereby revised for this Project to include the following:

DESCRIPTION

For this Project the Coarse Wavelength Division Multiplexing SFP shall be a single wavelength CWDM Small Form-Factor Pluggable (SFP) optic module for installation in a Ciena 3930/3931 Carrier Ethernet Service Delivery Switch (SDS). There shall also be a matching CWDM SFP optic module installed in the corresponding Ciena 5150 Carrier Ethernet Service Aggregation Ethernet Switch (SAS) located in an existing or new regeneration node building.. All CWDM SFP optic modules shall be provided from a manufacturer recommended by Ciena.

MATERIALS

The Contractor shall furnish and install the CWDM SFP optic modules in the wavelengths as shown in the item table below. This table describes optic modules for installation in Ciena 3930/3931 Carrier Ethernet SDS Ethernet switches, and Ciena 5150 Carrier Ethernet SAS switches located in existing or new regeneration node buildings. The Contractor shall be responsible for providing CWDM SFP optic modules for corresponding Ciena 5150 Carrier Ethernet SAS switches utilized on this project.

Item Table – CWDM SFP Optic Modules for Ciena 3930 Carrier Ethernet SDS switches, Ciena 5150 Carrier Ethernet SAS switches.

Item Description	Item Number
100M/1 GIG, SM SFP OPTIC, LC CONNECTOR, 80 KM, 1430 NM, EXT. TEMP	XCVR-A80D43
100M/1 GIG, SM SFP OPTIC, LC CONNECTOR, 80 KM, 1450 NM, EXT. TEMP	XCVR-A80D45
100M/1 GIG, SM SFP OPTIC, LC CONNECTOR, 80 KM, 1470 NM, EXT. TEMP	XCVR-A80D47
100M/1 GIG, SM SFP OPTIC, LC CONNECTOR, 80 KM, 1490 NM, EXT. TEMP	XCVR-A80D49
100M/1 GIG, SM SFP OPTIC, LC CONNECTOR, 80 KM, 1510 NM, EXT. TEMP	XCVR-A80D51
100M/1 GIG, SM SFP OPTIC, LC CONNECTOR, 80 KM, 1530 NM, EXT. TEMP	XCVR-A80D53
100M/1 GIG, SM SFP OPTIC, LC CONNECTOR, 80 KM, 1550 NM, EXT. TEMP	XCVR-A80D55
100M/1 GIG, SM SFP OPTIC, LC CONNECTOR, 80 KM, 1570 NM, EXT. TEMP	XCVR-A80D57
100M/1 GIG, SM SFP OPTIC, LC CONNECTOR, 80 KM, 1590 NM, EXT. TEMP	XCVR-A80D59
100M/1 GIG, SM SFP OPTIC, LC CONNECTOR, 80 KM, 1610 NM, EXT. TEMP	XCVR-A80D61

If for any reason the CWDM SFP optic modules are defective or are damaged at the time of installation by either the Contractor or by Ciena, the optic module shall be removed and replaced at no additional cost to the Project. CWDM SFP optic modules shall also be replaced if any failures occur due to manufacture's defect, at no additional cost to the Project prior to the final network acceptance.

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REVISION OF SECTION 614
COARSE WAVELENGTH DIVISION MULTIPLEXING SFP

When requesting quotations, the Contractor shall submit to the Ciena distributor a complete package including the following items:

1. A complete list of required equipment for purchase including materials and quantities based on the individual Project specifications item including those items that are required to achieve the complete work items and installation per the Project plans.
2. A PDF copy of all Project specifications pertaining to the material being ordered.
3. A PDF copy of all networking Project plan sheets.

It is the Contractor's responsibility to provide the distributer's representative all information required pertaining to the complete network design.

CONSTRUCTION REQUIREMENTS

For Ciena 3930/3931 Carrier Ethernet SDS switch installations, a CWDM SFP optic module(s) shall be installed in each switch for CWDM data communications. A matching CWDM SFP optic module shall be at its corresponding Ciena 5150 Carrier Ethernet SAS switches located in existing or new regeneration node buildings.

The Contractor shall ensure that the wavelengths of the CWDM SFP optic modules installed in the Ciena 3930/3931 Carrier Ethernet SDS Ethernet switches match those installed in the corresponding Ciena 5150 Carrier Ethernet SAS Ethernet switch to ensure proper data communications.

See project specific Testing & Integration Plan for additional requirements.

REVISION OF SECTION 614
DENSE WAVE DIVISION MULTIPLEXING (DWDM)

Section 614 of the Standard Specifications is hereby revised for this Project to include the following:

DESCRIPTION

For this Project, Ciena's Common Photonic Layer shall be utilized as the DWDM transport platform and support up to 44 wavelengths at 100 GHz channel spacing as indicated in the table below. It shall be a supported service layer network element for the Ciena 6500 Packet-Optical Platform.

Dense Wave Division Multiplexing (DWDM)

Channel (#)	Frequency (GHz)	Wavelength (nm)	Channel (#)	Frequency (GHz)	Wavelength (nm)
1	190100	1577.03	37	193700	1547.72
2	190200	1576.03	38	193800	1546.92
3	190300	1575.37	39	193900	1546.12
4	190400	1574.54	40	194000	1545.32
5	190500	1573.71	41	194100	1544.53
6	190600	1572.89	42	194200	1543.73
7	190700	1572.06	43	194300	1542.94
8	190800	1571.24	44	194400	1542.14
9	190900	1570.42	45	194500	1541.35
10	191000	1569.59	46	194600	1540.56
11	191100	1568.11	47	194700	1539.77
12	191200	1567.95	48	194800	1538.98
13	191300	1567.13	49	194900	1538.19
14	191400	1566.31	50	195000	1537.40
15	191500	1565.50	51	195100	1536.61
16	191600	1564.68	52	195200	1535.82
17	191700	1563.86	53	195300	1535.04
18	191800	1563.05	54	195400	1534.25
19	191900	1562.23	55	195500	1533.47
20	192000	1561.42	56	195600	1532.68
21	192100	1560.61	57	195700	1531.90
22	192200	1559.79	58	195800	1531.12
23	192300	1558.98	59	195900	1530.33
24	192400	1558.17	60	196000	1529.55
25	192500	1557.36	61	196100	1528.77
26	192600	1556.56	62	196200	1527.99
27	192700	1555.75	63	196300	1527.22
28	192800	1554.94	64	196400	1526.44
29	192900	1554.13	65	196500	1525.66
30	193000	1553.33	66	196600	1524.89
31	193100	1552.52	67	196700	1524.11
32	193200	1551.72	68	196800	1523.34
33	193300	1550.92	69	196900	1522.56
34	193400	1550.12	70	197000	1521.79
35	193500	1549.32	71	197100	1521.02
36	193600	1548.52	72	197200	1520.25

ITU Grid: C-Band, 100 GHz Spacing
Note: for 200 GHz spacing use either odd or even numbered channels.

REVISION OF SECTION 614
SMALL FORM-FACTOR PLUGGABLE – 1310NM SFP

Section 614 of the Standard Specifications is hereby revised for this Project to include the following:

DESCRIPTION

For this Project the Small Form-Factor Pluggable –SFP shall be a single wavelength SFP optic module for installation in Ciena 3930/3931 switches. All SFP optic modules shall be provided from a manufacturer recommended by Ciena.

MATERIALS

The Contractor shall furnish and install the SFP optic module shown in the item table below. This table describes the optic module for installation in the Ciena 3930/3931 Switches installed on this Project.

Item Table – 1310nm SFP Optic Modules for a Ciena 3930/3931 Ethernet SDS Switch.

Item Description	Item Number
100M/1 GIG, SM SFP OPTIC, LC CONNECTOR, 10 KM, 1310 NM, EXTENDED TEMPERATURE	XCVR-A10Y31

If for any reason the SFP optic modules are defective or are damaged at the time of installation by either the Contractor or by Ciena, the optic module shall be removed and replaced at no additional cost to the Project. SFP optic modules shall also be replaced if any failures occur due to manufacturer's defects, at no additional cost to the Project prior to the final network acceptance.

When requesting quotations, the Contractor shall submit to the Ciena distributor a complete package including the following items:

1. A complete list of required equipment for purchase including materials and quantities based on the individual item as noted in the Project specifications including those items needed to achieve a work completed and installed per the Project plans.
2. A PDF copy of all Project specifications pertaining to the material being ordered.
3. A PDF copy of all networking Project plan sheets.

It is the Contractor's responsibility to provide the distributer's representative all information required pertaining to the complete network design. During the bidding process, the Ciena distributor or Ciena Corporation is not responsible for any type of network design aide. All questions pertaining to the design shall be through the Department for help or clarification.

CONSTRUCTION REQUIREMENT

For Ciena Carrier Ethernet switch installations, 1310nm SFP optic module shall be installed in each switch for data communications in a CWDM design between 2 adjoining Ethernet switches (and at switches located between two adjoining switches, as applicable).

See project specific Testing & Integration Plan for additional requirements.

REVISION OF SECTION 614
BUFFER TUBE FAN-OUT KIT

Section 614 of the Standard Specifications is hereby revised for this Project to include the following:

DESCRIPTION

For this Project, the Buffer Tube Fan-out Kit shall be furnished and installed on single mode fiber optic lateral cable ends in field communications cabinets.

MATERIALS

Buffer Tube Fan-Out Kits shall match the number of fiber strands in the lateral fiber optic cable. Buffer tube fan-out kits shall be compatible with the fiber optic cable being terminated and shall be color-coded to match the lateral fiber strand color. Fan out kit buffer tubes shall be 900 um. The buffer tube fan out kit fiber strand length shall be sufficient for routing and placement in the termination panel. All components of the fan-out kit shall be rated for outdoor use.

CONSTRUCTION REQUIREMENTS

The Contractor shall install fiber optic buffer tube fan-out kits on the lateral cable in each communications cabinet. The Contractor shall install fanned out cables on the ends of lateral fiber cable strands. Buffer tubes for lateral fiber strands shall be neatly coiled and secured within the field termination panels. Taping or leaving the buffer tubes unmanaged shall not be allowed.

REVISION OF SECTION 614
FIBER OPTIC TERMINATION PANEL

Section 614 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

This work consists of furnishing and installing fiber optic termination panels in communication cabinets and node regeneration buildings for single mode fiber optic cables.

MATERIALS

1. *Field Device Locations*. Fiber optic termination panels furnished and installed for field device locations shall meet the following requirements:

   All termination panels shall be manufactured using aluminum and shall be finished with powder coat. The termination panels shall accommodate lateral fiber optic cables as shown on the plans. All termination panels shall be equipped with six port Straight Tip (ST) type bulkheads and be compliant with the Telcordia Technologies Generic Requirement (GR) GR-326 *Generic Requirements for Single Mode Optical Connectors and Jumper Assemblies, Latest Issue*. The manufacturer shall perform acceptance testing for insertion loss and return loss with the test certification provided with each patch panel.

   All termination panels shall be compatible with the fiber optic cable being terminated.

   The six port panels shall have hinged doors that provide access to both the fiber fan out and the termination bulkheads. The panel shall be sized to accommodate the entry of the lateral fiber optic cable, fiber fan out, and bulkheads with the access door closed. The fiber optic patch panel shall be suitable for wall mounting. Dimensions shall not exceed 5 inches wide × 6 inches long × 2 inches deep. Each fiber optic patch panel shall include a fiber adapter panel, adapters, field termination and polishing of fiber, strain relief, grommet tape, zip ties and wall mounting bracket. Terminations within the patch panel shall be polished with a physical contact (PC) finish.

   24 port termination panels for lateral fiber optic cables shall be provided to accommodate 24 ports. 24 port termination panels shall be compatible with a 19-inch equipment rack. The panels shall be provided with two six port ST type bulkheads. The panel shall be provided with covers for the remaining spaces. The termination panel shall have a slide out interior.

   Bulkheads in all termination panels shall be metal. Plastic bulkheads will not be accepted.

2. *Node Buildings*. Fiber optic termination/splice panels furnished and installed for node building locations shall meet the following requirements:

   288 port termination/splice panels shall be provided at each node building where the 216 fiber optic backbone terminates. 24 port termination/splice panels shall be provided at each node building where the 24 strand fiber optic cable terminates. Fiber optic termination/splice panels shall be 19 inch EIA/ECA-310 compatible for mounting in cabinets and be equipped with a see-through latching front cover. The fiber optic termination/splice panel shall be designed around the physical protection requirements of Telcordia GR-63 *Network Equipment Building System (NEBS) Requirements*. It shall utilize aluminum construction per the requirements of ASTM B209 *Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate*.

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FIBER OPTIC TERMINATION PANEL

All fiber optic termination/splice panels shall come pre-configured with plates, adapters, splice drawers, connectors with pigtails, all necessary hardware, and cable clamps.

The connector style shall be LC (duplex) with an Angled Physical Contact (APC) finish and an optical return loss meeting or exceeding -60 dB. Each fiber optic termination/splice panel shall be loaded to accommodate the termination of all fibers contained within the proposed backbone cable, unless fibers are spliced through and not landed on the termination/splice panel. The termination panel shall have the ability to remove individual bulkheads or a set of bulkheads to access and clean the backside connection for future maintenance or troubleshooting, unless connectors are factory sealed in a module with a pigtail. Pigtails shall be stranded with single mode fibers and a minimum length of 15 feet for splicing and coiling. Pigtails shall be organized in the optical splice shelf. Buffer tubes, in splice tray, shall be secured with velcro strips unless stated another method is Approvedd by the manufacturer. Fusion splicing shall be utilized with heat shrink sleeve protectors, therefore the splice tray capacity, splice tray slots for fusion splices and number of splice trays shall be provided to accommodate the number of backbone fiber to pigtail splices along with the size of heat shrink sleeve protectors utilized. One cable clamp shall be provided for each fiber optic termination/splice panel.

Bulkheads in all termination panels shall be metal. Plastic bulkheads will not be accepted.

CONSTRUCTION REQUIREMENTS

Six port termination panels for lateral fiber optic cables shall be installed at locations where either existing or proposed equipment does not allow for the installation of a 24 port termination panel.

24 port termination panels shall be installed within communications cabinets and shall be mounted in locations that allow for ease of access and shall not interfere with maintenance of the internal equipment. 24 port termination panels shall be installed in communications cabinet 19-inch equipment racks.

Fiber terminations shall be as shown on the plans. The Contractor shall field terminate ST type bulkhead connectors on the ends of the lateral fiber cable strands and install them on the back side of the termination panel. The terminated connectors shall be nickel-plated with a ceramic ferrule and shall be polished with a physical contact finish. Buffer tube fan-out kits shall be paid for in accordance with the Revision of Section 614 – Buffer Tube Fan-Out Kit.

All termination panels shall have a labeling scheme that complies with the Department's current standard.

Instead of field terminating and polishing lateral fiber optic cables, the Contractor may use a single mode fiber pigtail that is factory terminated on six port ST type bulkhead and fusion splice the pigtail to the lateral fiber optic cable. If this method is used, the termination panel shall be sized and configured to accommodate splicing of the pigtail.

The Contractor shall use proper strain relief inside the termination panel for the fiber cable and fiber fan out strands per the manufacturer's recommendations. The use of tape to secure the individual fanned out strands to the bottom of the termination panel shall not be allowed. The Contractor shall allow enough

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REVISION OF SECTION 614
FIBER OPTIC TERMINATION PANEL

slack in the terminated fiber to allow for opening and closing the termination panel without disturbing the terminated fiber.

All hardware shall be installed in accordance with manufacturer's recommendations.

See project specific Testing and Integration plan for additional requirements.

REVISION OF SECTION 614
OPTICAL ATTENUATOR

Section 614 of the Standard Specifications is hereby revised for this Project to include the following:

DESCRIPTION

Coarse Wavelength Division Multiplexing Attenuator shall be installed for both CWDM and 1310nm SFP optic modules to reduce optical signal power to a receive level specified for the SFP optic modules based on the transmission loss of the corresponding link. These shall be installed at Ciena 3930/3931 Carrier Ethernet Service Delivery Switch and regeneration node building Mux/DeMux locations. The attenuator shall be installed in the receive port of the equipment cabinet fiber optic termination patch panel bulkhead or Mux/DeMux. All attenuators shall be compatible with the Ciena CWDM SFP optic modules.

MATERIALS

The Contractor shall furnish and install single mode, 9/125um CWDM wavelength independent attenuators to attenuate the incoming signal to a power acceptable within the Ethernet switch SFP optic module receive range.

For testing and attenuator selection, wavelengths of SFP optic modules on this Project are:

1430nm, 1450nm, 1470nm, 1490nm, 1510nm, 1530nm, 1550nm, 1570nm, 1590 nm, and 1610nm.

Attenuators for 1310nm wavelength SFP optic modules will not be required unless the incoming power exceeds the rated receive power of the SFP optic module, including a design margin of 6 dB (to allow for degradation over the life of the system).

The Contractor shall furnish and install a female to male plug type fiber optic attenuator. The types of fiber optic attenuators to be supplied shall match both the termination patch panel bulkhead port, the Mux/DeMux port and the fiber optic pre-connectorized patch cable connector.

The attenuators shall meet the following minimum specifications:

(1) Return Loss: Less than or equal to 65dB (APC)

(2) Attenuation Accuracy: +/-0.5 (1~10) +/-1.0(11~30)

(3) Polarization Dependent Loss: Less than 0.2dB

(4) Maximum Optical Input Power: 200mW

(5) Operating Temp Range: -40 to 80°C

(6) Low Polarization Dependent Loss (PDL)

(7) Minimum 500 connect/disconnecting tested

The attenuators to be provided shall conform to the requirements of Telcordia Technologies GR-910 Generic Requirements for Fiber Optic Attenuators.

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REVISION OF SECTION 614
OPTICAL ATTENUATOR

CONSTRUCTION REQUIREMENTS

After all splicing and fiber optic testing is completed the Contractor shall test the optical power of the incoming, (Receive) signal at each field Ethernet switch and existing node building location. To obtain the most accurate values of optical power, the testing equipment shall be attached to the SFP optic end of the pre-connectorized patch cable to be installed at that location.

Once the optical power has been tested, the Contractor shall install the appropriate attenuator in the receive port to meet the receive values of the SFP optic module, including a design margin of 6 dB (to allow for degradation over the life of the system).

Prior to installation, all attenuators shall be cleaned with lint-free fiber wipes moistened with Isopropyl Alcohol 99% U.S.P. After cleaning with alcohol, the bulkhead shall be cleaned with an optical connector cleaner to ensure that all residues are removed.

See project specific Testing & Integration Plan for additional requirements.

REVISION OF SECTION 614
SINGLE WAVELENGTH COARSE WAVELENGTH DIVISION MULTIPLEXING (CWDM) OPTICAL FILTER

Section 614 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

Single Wavelength Coarse Wavelength Division Multiplexing (CWDM) optical filter shall be manufactured specifically for use in CWDM equipment. It shall be provided and installed at all Ciena 3930/3931 Carrier Ethernet SDS Switch locations. All CWDM single channel filters shall be provided from a manufacturer recommended by Ciena.

MATERIALS

The CWDM optical filter shall have the capability of splitting a single CWDM wavelength from the multiple wavelengths being transmitted along the fiber strands including passing a 1310nm wavelength between Ethernet switch pairs. All remaining wavelengths other than those being added or dropped at the designated location shall be allowed to travel from Ethernet switch to Ethernet switch or regeneration node building.

The CWDM optical filters shall be provided with industry standard operating ranges of 1430nm to 1610nm to match wavelengths of the Coarse Wavelength Division Multiplexing Small Form-Factor Pluggable optic modules of the Ciena Ethernet switches. The individual filters shall have the following channel center wavelengths;

1430nm, 1450nm, 1470nm, 1490nm, 1510nm, 1530nm, 1550nm, 1570nm, 1590nm and 1610nm.

1310nm wavelength filters shall also be provided.

If for any reason the single wavelength filter is defective or is damaged at the time of installation by the Contractor, the filter shall be removed and replaced at no additional cost to the Project. Filters shall also be replaced if failures occur due to manufacture's defect, at no additional cost to the project prior to the final network acceptance.

CONSTRUCTION REQUIREMENTS

The filters shall match the industry standard wavelength of the Ethernet switch's Coarse Wavelength Division Multiplexing Small Form-Factor Pluggable (SFP) optic module and the 1310nm SFP optic module.

The CWDM optical filters shall have three (3) fiber pigtails to be fusion spliced to lateral fiber optic cable strands and secured in the foam splice chips located on the splice tray in the splice closure. The pigtails shall be provided with distinctive buffer tube colors designating "Pass", Reflect" and "Common". If the filter pigtail buffer tubes are all of the similar color, The Contractor shall color code each individual tube for future maintenance.

The filters shall be provided with the optical wavelength printed indelibly on the filter body.

Bare fiber strands shall not be taped to the splice tray.

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REVISION OF SECTION 614
SINGLE WAVELENGTH COARSE WAVELENGTH DIVISION MULTIPLEXING (CWDM) OPTICAL FILTER

All splices and optical filter wavelengths shall be labeled on the splice tray.

If for any reason the Contractor installs or splices any single wavelength optical filter in a location which does not match the Ethernet switch coarse wavelength division multiplexing SFP optic modules, the Contractor shall replace the filter and re-splice all fibers at no additional cost to the Project.

Prior to splicing of the filters, the Contractor shall submit to the Department a Microsoft Excel spreadsheet containing the following information:

(1) Splice Location for the CWDM and 1310nm filters (manhole milepost).

(2) Serial Number of the CWDM and 1310nm filters.

(3) Wavelength of the filter.

(4) Usage and color of filter pigtails.

Once the spreadsheet has been submitted and Approvedd by the Department the splicing may begin.

The pigtails of the filters shall be labeled inside the splice closure.

See project specific Testing & Integration Plan for additional requirements.

REVISION OF SECTION 614
COARSE WAVELENGTH DIVISION MULTIPLEXING MODULE

Section 614 of the Standard Specifications is hereby revised for this Project to include the following:

DESCRIPTION

Coarse Wavelength Division Multiplexing (CWDM) Module for this Project shall be rack mounted and support 10 wavelengths from 1430nm to 1610nm with LC/APC Port Bulkheads, Test In Port, Test Out Port and Pass Port installed in regeneration node buildings. The unit shall have the capabilities of passively multiplexing and de-multiplexing multiple wavelengths to and from field Ciena 3930/3931 Ethernet switches and regeneration node building Ciena Ethernet Switch small form-factor pluggable optic modules.

The 10-channel CWDM modules shall be supplied with the ability of connecting a Spectrum Analyzer to the test ports to test both the incoming and outgoing wavelengths without the need of disconnecting active patch cables transmitting or receiving data.

MATERIALS

Each 10-channel CWDM module shall have twelve (12) transmit / receive ports. Ten of the 12 ports shall be for individual wavelength matching the Ethernet switch CWDM, SFP optic modules.

The bulkhead connector for each port on the CWDM module shall be of the duplex LC/APC type; simplex LC/APC type bulkhead connector ports shall not be allowed.

The 10-channel CWDM module shall have the ability of multiplexing and de-multiplexing the following wavelengths;

1430nm, 1450nm, 1470nm, 1490nm, 1510nm, 1530nm, 1550nm, 1570nm, 1590nm and 1610nm.

The 10-channel CWDM modules shall also include a chassis capable of mounting in a 19 inch communications equipment rack or cabinet. The chassis shall have an integrated cable management tray on the front side to house the optical patch cables installed from the CWDM multiplexing module ports to the Ethernet switch optic modules.

CONSTRUCTION REQUIREMENTS

The 10-channel CWDM multiplexing modules and chassis shall be installed in 19 inch equipment racks or cabinets in regeneration node buildings. The 10-channel CWDM multiplexing modules and chassis shall be installed adjacent to its corresponding Ciena 5150 Carrier Ethernet SAS switch. New chassis and CWDM modules shall be procured in the quantities needed specifically for this Project. Single mode, bend insensitive, pre-connectorized duplex patch cable with a polyurethane jacket shall be installed from the 10-channel CWDM module to the backbone termination patch panel for transmitting and receiving communications to the field Ethernet switches. Connectors for the patch cable shall be LC on the 10-channel CWDM module end and LC on the termination patch panel end.

Single mode, bend insensitive, pre-connectorized duplex patch cables with a polyurethane jacket shall be installed from each 10-channel CWDM module wavelength Tx/Rx port to the matching CWDM SFP optic module its corresponding Ciena 5150 Carrier Ethernet SAS switch. A duplex patch cable shall be

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COARSE WAVELENGTH DIVISION MULTIPLEXING MODULE

installed for each wavelength. Connectors for the patch cables shall be LC on the10-channel CWDM module end and LC on the Ethernet switch SFP optic module end.

In regeration node buildings, the patch cables shall be of sufficient length to span from the termination patch panel to the 10-channel CWDM module and from the 10-channel CWDM module to the Ciena 5150 Ethernet switch with a maximum of four (4) feet of slack for each cable. They shall be installed in a manner which will not interfere with equipment in the equipment racks and will include cable management so as not to interfere with future maintenance within the rack.

If for any reason the 10-channel CWDM module is defective or is damaged at the time of installation by the Contractor, the item shall be removed and replaced at no additional cost to the Project. Modules shall also be replaced if any failures occur do to manufacture's defect at no additional cost to the Project prior to the final network acceptance.

See project specific Testing & Integration Plan for additional requirements.

REVISION OF SECTION 614
COARSE WAVELENGTH DIVISION MULTIPLEXOR - OPTICAL TIME DOMAIN REFLECTOMETER

Section 614 of the Standard Specifications is hereby revised for this Project to include the following:

DESCRIPTION

For this Project Coarse Wavelength Division Multiplexing – Optical Time Domain Reflectometer (CWDM-OTDR) shall be a modular testing unit capable of testing coarse wavelength division multiplexing (CWDM) optical networks. After Project usage by the Contractor for fiber testing and analysis for the network turn up, the CWDM-OTDR shall become the property of the Colorado Department of Transportation, Colorado Transportation Management Center. The turnover shall be after the Contractor has completed all of the proposed fiber optic testing as stated in the Project specifications.

MATERIALS

The CWDM-OTDR shall be a portable device and shall have the ability to test 10 CWDM wavelengths including 1430nm, 1450nm, 1470nm, 1490nm, 1510nm, 1530nm, 1550nm, 1570nm 1590nm and 1610nm and shall meet with the following minimum requirements:

CWDM-OTDR Modular Test Unit Platform

1. The test set display shall have a 6.4” minimum color touch screen and shall offer the option of an optional outdoor enhanced screen.

2. The CWDM-OTDR shall be modular with at least 2 supported modules for optical testing, Ethernet, SDH, OSA and CD/PMD.

3. The platform shall support the use of a Fiber Inspection Probe with end-face analysis software.

4. The platform shall provide at least two USB 2.0 ports, one RJ-45 LAN 10/100/1000 Mbit/s, one headset jack.

5. Internal Storage - The test unit shall have 8 GB minimum internal memory, with this ability for a 16 GB internal memory upgrade configuration.

CWDM-OTDR Module Unit shall provide the following

1. Support ITU-based CWDM wavelengths of ±3nm of central wavelength.

2. Support the intelligent Optical Link Mapper (iOLM) application

3. Use a dynamic multipulse acquisition that combines all the results into a single view, a single report and a single file.

4. Automatically adjust the test parameters in function of the link under test with no intervention from the user.

5. Have a dynamic range of minimum 40dB per wavelength.

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COARSE WAVELENGTH DIVISION MULTIPLEXOR - OPTICAL TIME DOMAIN REFLECTOMETER

6. Display the fiber elements in a linear view with representative icons for splice, connector, macro bend, splitter and end of fiber.

7. Display individual pass/fail status for each element of the network as well as a clear pass/fail status, all in the same window.

8. Prompt specific and detailed diagnosis on how to fix the network based on the failure cause found by the unit.

9. Capable of measuring the first connector of the network without the use of a launch cable.

10. Capable of using pre-defined or user-defined templates to set the pass/fail thresholds and identify the link information accordingly.

11. Test configurations should not include pre-defined test parameters such as pulse width, distance range or averaging time as these parameters should be always set by the unit automatically.

12. Support multiple level of auto-increment for file naming, be flexible for the number of increments and be flexible for the label name of increment.

13. Support, with user-defined, a minimum, a maximum and a maximum + minimum threshold for pass/fail status.

14. Be capable of generating reports in HTML format, directly from the platform.

15. Combine single mode and multimode testing into a single module

16. Have an event dead zone of maximum 0.8m on a -45dB reflectance, measured at 1.5dB on each side below the peak.

17. Have an attenuation dead zone of 4.5 meters or shorter on a -45dB reflectance, measured 0.5dB above the backscattering level.

18. Have a minimal sampling resolution of 0.04 meters.

19. Capable of storing over 5,000 OTDR traces

20. Shall be supplied with a batch post-processing software to generate reports, analyze the results, edit/add information to the files, for multiple files simultaneously.

The OTDR unit shall be used as a CW source to the selected wavelength for loss measurements.

The OTDR unit shall have a linearity of ±0.03dB/dB or better.

The OTDR unit shall have a distance accuracy of ± (0.75 m + 0.0025% x distance) or better.

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COARSE WAVELENGTH DIVISION MULTIPLEXOR - OPTICAL TIME DOMAIN REFLECTOMETER

The CWDM-OTDR shall include the minimum following performance features:

1. A suspend mode from which the test set shall return to a "ready to test" state within 10 seconds.

2. Support the capability to run multiple applications and programs simultaneously.

3. Provide a multi-tasking environment and the capability to switch between different running applications.

4. The operating system shall be based on Windows OS technology and shall provide access to the Windows desktop.

5. The batteries shall be rechargeable lithium-ion batteries providing at least 8 hours of OTDR/iOLM operation as per Bellcore GR-196.

6. Shall operate while connected to a power supply (AC/DC adapter, input 100-240 VAC, 50-60 Hz) with or without the battery connected.

7. There shall be housing for the ability to provide for a built-in optional VFL and power meter (InGas or GeX, with or without CWDM frequencies).

8. The option for the following wireless interfaces:

   A. 3G (additional hardware accessory)

   B. Wi-Fi (built in hardware option)

   C. Bluetooth (built in hardware option)

The CWDM-OTDR shall include the minimum following management features:

1. Cloud –based server application for device management with direct communication link to in platforms in the field.

2. Provides secure data storage and automatic backup of all data.

3. The server application supports communication (interoperable) with multiple platform types for broad-based applications.

4. The server application supports the automatic detection and synchronization of a platform to the server.

5. The management application supports the automatic upload of device inventory information to management application (no manual data entry).

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COARSE WAVELENGTH DIVISION MULTIPLEXOR - OPTICAL TIME DOMAIN REFLECTOMETER

6. The management application supports the automatic upload and display of all platform inventory data including: name of platform, alias, serial number, platform type, name of last user, name of the owner of the platform, test modules installed in platforms and all installed software and versions.

7. The management application supports the automatic, parallel distribution of software (push) to multiple (100+) user defined platforms simultaneously.

8. The management application supports the automatic, parallel distribution (push) of any file format including test configuration profiles to multiple (100+) user defined platforms simultaneously. File types should include but not limited to (.txt, .csv, .xls, .ppt, .doc, .pdf, .mp4, .avi, .wmv,)

9. The management application supports the ability to create customized reports based on the inventory data.

10. The management application supports the ability to create customized report templates that can be run on the database at any time.

11. The management application supports the automatic upload of test results directly from the platforms in the field. Supported test report uploads includes: Ethernet test reports (Y.1564, RFC2544, BERT), SONET/SDH reports (BERT), physical layer reports (OTDR, PMD, Chromatic dispersion (CD), Optical loss tests (OLTS), Optical spectrum analyzer (OSA)).

12. The management application provides search/filter capabilities to quickly pinpoint any test.

13. The management application provides a standardized format for all uploaded test results.

The CWDM-OTDR shall have the ability for both fiber optic inspection and the analysis of the findings by the device and include the minimum following Optical Verification and Performance Testing features:

1. The unit must support a fiber inspection probe for connector end-face inspection as well as on-board automated pass/fail analysis.

2. The fiber inspection probe shall have an Auto center feature that is compatible with single fiber connectors and MPO/MTP connectors.

3. The inspection probe shall have an Auto focus feature that is compatible with single fiber connectors and MPO/MTP connectors

4. The fiber inspection probe shall support 3 levels of magnifications :

   a) High Magnification field of view: 304 µm x 304 µm

   b) Medium magnification field of view: 608 µm x 608 µm

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COARSE WAVELENGTH DIVISION MULTIPLEXOR - OPTICAL TIME DOMAIN REFLECTOMETER

c) Low magnification field of view: 912 µm x 912 µm

5. The fiber inspection probe shall have a capturing device of 5 megapixel CMOS or better.

6. The fiber inspection probe shall have a blue LED light source.

7. The fiber inspection probe shall have a resolution of 0.55µm or better.

8. The fiber inspection probe shall have a rugged design with rubber over molding for field applications.

9. The fiber inspection probe should have a protective cap to protect the probe tip from physical damage.

10. The fiber inspection probe shall support drop test resistance of 1 meter on a concrete surface on various axis

11. The fiber inspection probe shall have a Pass/Fail status LED on the probe body.

12. The fiber inspection probe shall have a capture and analysis button.

13. The fiber inspection probe shall be compatible with handheld display, portable platforms or laptop/PC.

14. The fiber inspection probe unit shall weight ≤0.3 kg (0.66 lb)

15. The fiber inspection probe unit shall support operating temperature of -10°C to 50°C and storage temperature -40°C to 70°C.

16. The fiber inspection probe unit shall allow the user to retest the same connector without affecting the file naming and report structure.

The fiber inspection probe must support a wide variety of inspection tips including but not limited to :

1. FC/SC APC tip for bulkhead adapter

2. LC tip for bulkhead adapter

3. LC angled tip for bulkhead adapter (60º)

4. LC/APC tip for bulkhead adapter

5. FC and SC angled tip for bulkhead adapter (60º)

6. SC tip for PC bulkhead adapter (extended)

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COARSE WAVELENGTH DIVISION MULTIPLEXOR - OPTICAL TIME DOMAIN REFLECTOMETER

7. ST tip for bulkhead adapter

8. Universal patch cord tip for 1.25 mm ferrule

9. Universal patch cord tip for 1.25 mm APC ferrule

10. Universal patch cord tip for 2.5 mm APC ferrule

11. ODC Socket (male) tip

12. ODC 2 Pin Plug (female) Guide & Universal tip

13. Optitap

14. MPO/MTP UPC and APC

15. The unit shall support the IEC-3-35/IPC 8497-1 standards or user-defined acceptance criteria.

16. The pass/fail connector analysis time shall be under 5 seconds

17. The application shall have a focus protection in the software to prevent out-of-focus image analysis

18. The connector analysis's focus level should appear in the test reports to ensure integrity of the results.

19. The unit shall be capable of modifying existing connector analysis standard criteria directly from the platform's application without the need of external software.

20. The unit shall be capable of generating reports directly from the field instrument without the need of external software.

Additional accessories and material to be provided with the CWDM-OTDR shall be:

Protective carrying case

1. Optical fiber trace software for report generation

2. Warranties

3. Configuration Certification

4. All Miscellaneous cabling

5. Instructions on all equipment units

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REVISION OF SECTION 614
COARSE WAVELENGTH DIVISION MULTIPLEXOR - OPTICAL TIME DOMAIN REFLECTOMETER

As part of the furnishing of the CWDM-OTDR, Contractor shall coordinate with onsite manufacturer representative to provide training for the proper use of the CWDM-OTDR. Training costs shall be included with the work. See Project Special Specification 614 – Test and Support Equipment for detailed requirements of the training.

REVISION OF SECTION 614
TEST AND SUPPORT EQUIPMENT

Section 614 of the Standard Specifications is hereby revised for this Project to include the following:

DESCRIPTION

For this Project Test and Support Equipment shall include furnishing test equipment required to successfully turn up, test and analyze the fiber optic coarse wavelength division multiplexing Ethernet fiber optic network on this Project. The equipment shall be used by the Contractor during the Project construction time then delivered to the Colorado Department of Transportation, Colorado Transportation Management Center at the end of all network fiber optic testing and network acceptance.

MATERIALS

The Contractor shall purchase the test and support equipment prior to the installation of the fiber optic cable. The Contractor shall keep all equipment at a secured location to ensure that no loss or damage is caused by either vandalism or theft. At the end of the fiber optic network installation and acceptance, all test and support equipment shall become the property of Colorado Department of Transportation, Colorado Transportation Management Center.

The following equipment shall be included in work Test and Support Equipment. This equipment shall be used in the manner as stated in the Project Special Provision Specifications as part of this Project for fiber optic cable testing. An independent specification is provided in the Project Special Provision Specifications package for this item. The Contractor is required to submit cut sheet submittals for equipment included in this Specification.

Coarse Wavelength Division Multiplexing, Optical Time-Domain Reflectometer

The Coarse Wavelength Division Multiplexing, Optical Time-Domain Reflectometer (OTDR) shall include but not be limited to the OTDR unit, individual Coarse Wavelength Division Multiplexing (CWDM) testing modules, fiber inspection probe, cabling, OTDR trace reading software, operational documentation, protective case, calibration documentation, power cabling, warranties and all other materials provided with the original Coarse Wavelength Division Multiplexing, Optical Time-Domain Reflectometer purchase.

The Contractor shall purchase the test equipment listed prior to the installation of the fiber optic cable. During this time the Contractor shall become familiar with the equipment in preparation for use during the testing of the optical network. Once the optical fiber network is ready, the Contractor shall use this equipment for the CWDM testing.

Once the fiber optic network testing has been completed and the optical network has been accepted, the Contractor shall make arrangements for the transfer of all test and support equipment. The equipment shall be in “like new” condition with only normal wear and shall be fully tested and recalibrated prior to turnover. All recalibration and any required refurbishing to bring the equipment to the like new condition shall be conducted by the equipment manufacturer at the Contractor’s expense as part of work. All materials, hardware, accessories and cases associated with the test and support equipment shall also be turned over to the Department.

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REVISION OF SECTION 614
TEST AND SUPPORT EQUIPMENT

The Contractor shall schedule and provide training for the CWDM OTDR to the Colorado Transportation Management Center (CTMC) personnel. The training shall be scheduled and held in a meeting conference room at the CTMC in Golden Colorado. The Contractor shall work with Department to schedule and reserve the conference room at the CTMC.

The training shall be presented in person at the CTMC by the manufacturer's technical representative. Web conferencing / remote conferencing shall not be allowed. The Contractor shall schedule with the manufacturer to have a manufacturer's representative be on site at the CTMC to conduct the training. The Contractor may combine his training with the training for CTMC personnel utilizing the Project purchased equipment for training purposes.

The Test and Support Equipment shall include an Optical Spectrum Analyzer along with all associated materials, accessories and hardware for the equipment. All manufacture warranties shall be transferred to the Colorado Department of Transportation, Colorado Transportation Management Center upon the turnover of all materials. Onsite training by the manufacturer's technical representative is required.

REVISION OF SECTION 614
EQUIPMENT PROCUREMENT AND CONFIGURATION

Section 614 of the Standard Specifications is hereby revised for this Project to include the following:

DESCRIPTION

To ensure that the Colorado Transportation Management Center (CTMC) personnel have sufficient time for the final configuration of the Ethernet switches on this Project, the Contractor shall submit all network equipment cut sheets to the ITS Project Engineer 30 days prior to start of work. This submittal shall include but not be limited to the following Project network equipment;

- Ethernet Switches
- Coarse Wavelength Division Multiplexing, Small Form-Factor Pluggable Optic Modules
- 1310 NM Small Form-Factor Pluggable Optic Modules
- All Licensing And Warranty Documentation
- All Materials Associated With The Installation Of The Ethernet Switches

After the review and Approval of the networking equipment cut sheets by CDOT, the Contractor shall place the order for the approved equipment to the Ciena distributor to ensure the timely delivery of the above listed Project network equipment.

Work on the network equipment requires CTMC personnel to configure each individual Ethernet switch in addition to the configuration of this Project network into the CTMC statewide intelligent transportation optical network. CTMC personnel require approximately 3 weeks to configure the switches. The Contractor shall coordinate with the Project Engineer to schedule the CTMC personnel for a window of time that the configuration may occur, dependent on anticipated equipment delivery.

For all Ciena products on the Project the Contractor shall have a Ciena certified technician with associated training and technology certificates on site or via remote access for any configuration and set up support required for a fully functional network.

The Contractor shall provide all required information to the CTMC for the Ethernet switches. This includes but not limited to the highway mile point of the Ethernet switch, the Project stationing of the Ethernet switch, and the devices to which they are connected. This information shall be submitted on an Excel spreadsheet at the time that the Contractor delivers the Ethernet switches to the CTMC for configuration.

REVISION OF SECTION 614
CLOSED CIRCUIT TELEVISION

Section 614 of the Standard Specifications is hereby revised for this Project to include the following:

DESCRIPTION

This work consists of furnishing and installing a High Definition (HD) Internet Protocol (IP) Closed Circuit Television (CCTV) camera.

MATERIALS

CCTV camera shall include: The camera housing, pole mount adapter, Power over Ethernet (PoE) power supply, manufacturer supplied management software, Category 5e rated (Cat5e) cables, and all attachment hardware needed for a functionally complete installation.

(a) *Camera.*

The camera shall have pan, tilt, and zoom functionality enclosed in a sealed, environmentally controlled dome housing designed to operate in 100 percent humidity at an operating temperature range of -58°F to 122°F. The camera housing shall carry both IP66 and National Electrical Manufacturers Association (NEMA) 4x ratings. The camera shall utilize a 100 megabits per second 802.3 Ethernet connection for native communications and be powered from an 802.3at compliant Power over Ethernet (PoE) supply. The camera shall be able to display multiple individually configurable video streams up to 30 frames per second in high definition resolutions from 1920 x 1080 pixels to 320 x 180 pixels at a 16:9 aspect ratio in H.264 and Motion JPEG (MJPEG) formats using unicast or multicast delivery. The camera shall include functionality for onscreen titling, image overlay, and remote capture of at least 256 preset views. It shall include electronic image stabilization, ability to reduce effects of rain and fog in picture, and include ability to run manufacturer or third party analytics designed for roadway applications with output to initiate internal user programed events or alarms to external systems using an open application programming interface (API) structure. An internal web interface shall be included for configuration with security functionality allowing a minimum of 20 user access levels with password protection. The camera shall be capable of implementing stream authentication for video security and the ability to modify view and control priority among configured users. Options for video storage shall be available via onboard Secure Digital (SD) memory slot or to network share. Camera status and diagnostics shall be available via Simple Network Management Protocol (SNMP) traps. The camera shall support:

1. IPv4/v6
2. Hypertext Transfer Protocol (HTTP)
3. Hypertext Transfer Protocol Secure (HTTPS)
4. Secure Socket Layer/Transport Layer Security (SSL/TLS)
5. Quality of Service (QOS) Layer 3 Differentiated services (DiffServ)
6. File Transfer Protocol (FTP)
7. Simple Mail Transfer Protocol (SMTP)

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8. SNMP v1/2/3

9. Universal Plug and Play (UPnP)

10. Domain Name System (DNS)

11. Dynamic Domain Name System (DDNS)

12. Network Time Protocol (NTP)

13. Real-time Transport Protocol (RTP)

14. Real Time Streaming Protocol (RTSP)

15. Transmission Control Protocol (TCP)

16. User Datagram Protocol (UDP)

17. Internet Group Management Protocol (IGMP)

18. Real-time Transport Control Protocol (RTCP)

19. Address Resolution Protocol (ARP)

20. Socket Secure (SOCKS)

The camera shall be Open Network Video Interface Forum (ONVIF) compliant.

Technical specifications for the camera shall be as follows:

1. The lens shall be f=4.44 to 142.6 mm, F1.6 to F14.41, autofocus; focus range of 35 mm (wide) to 800 mm (telephoto) to infinity, with 62.8 degrees to 2.23 degrees horizontal angle of view.

2. Minimum illumination:

   A. Color: 0.3 lux at 30 IRE F1.6

   B. Black and White: 0.03 lux at 30 IRE F1.6

3. Shutter speed shall be variable from 1/33,000 to 0.25 seconds at 60 hertz.

4. The pan, tilt, and zoom functions shall provide 360 degrees of continuous pan rotation at 0.05 degrees per second to 450 degrees per second, a 220 degrees tilt range allowing for 20 degree view above the horizon at 0.05 degrees per second to 450 degrees per second, and minimum 32 times optical and 12 times digital zoom.

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(b) Manufacturer's Supplied Configuration and Management Software.

Configuration software shall be included which gives the user access to discover and configure the camera using standard network protocols.

A centralized management software shall also be available to remotely discover and manage all available cameras across an Ethernet network for monitoring and configuration. The management software should be based on a server client architecture and shall include functionality to receive camera status, manage and apply blanket firmware updates to applicable devices, view/add/change user access accounts, and manage and apply device configuration templates using specific parameters saved by the user.

(c) Pole-Mount Adapter Arm and Bracket.

The adapter shall have a minimum 33 pound load rating and have provisions that allow mounting directly to the weatherproof dome housing without modification to the housing. The adapter bracket shall have slots for a minimum of two straps or banding material for mounting to the poles with diameters ranging from 3 inches to 6 inches. The bracket shall have cable strain relief in at least two locations on the reverse side, between the bracket and the pole.

(d) Cat5e Cable.

Cable shall be an eight wire twisted pair cable constructed of 24 American Wire Gauge (AWG) stranded copper wires with minimum Cat5e rating. The outer jacket shall be ultraviolet (UV) resistant polyvinylchloride (PVC) insulation designed for outdoor use. Shielded cable shall be used when prescribed by the manufacturer, run through conduit and enclosed structures, and when needed for equipment or electrostatic grounding. Shielded cable shall be terminated with either conductive or non-conductive male 8P8C connectors. Where shielded cable is used as an equipment ground, conductive connectors shall be used on both ends of the cable. Where shielded cable is used as an electrostatic drain, the grounded side of the connection shall be terminated with a conductive connector and the ungrounded side shall be terminated with a non-conductive connector. Unshielded cable shall be used for interconnections within the same cabinet, or where grounding and electromagnetic interference is not present. Unshielded cable shall be terminated with non-conductive male 8P8C connectors on both ends. All Cat-5e cables used for Ethernet data shall conform to the Telecommunications Industry Association/Electronic Industries Alliance (TIA/EIA) T-568B pin/pair assignments.

(e) PoE Power Supply

The PoE power supply shall be a mid-span type power supply that conforms to IEEE 802.3at. The operating temperature range of the PoE power supply shall be -40°F to 185°F.

CONSTRUCTION REQUIREMENTS

The CCTV camera shall be installed in accordance with these specifications and in accordance with manufacturer's recommendations. The Contractor shall make arrangements required for a qualified manufacturer's representative to be on-site to ensure proper installation of the CCTV camera.

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The weatherproof dome housing shall be attached to the pole mount adapter using the materials supplied from the manufacturer.

The camera shall be attached 1 foot below the top of the pole at an orientation to achieve the optimal view of both the main and crossroad traffic, or as directed by the Engineer. Three quarter inch type 201 stainless steel strap used in conjunction with type 201 stainless steel buckles shall be used to band the camera assembly and pole mount adapter to the pole.

The PoE midspan module shall be securely mounted in the communication cabinet or directed by the Engineer. The PoE shall be plugged into a grounded non-ground-fault circuit interrupter (GFCI) protected outlet. If available, an Uninterruptible Power Supply (UPS) protected outlet shall be used to power the power supply.

A shielded Cat 5e cable with conductive RJ-45 terminations shall be run from the PoE supply to the camera providing a path to ground. A shielded Cat 5e cable with a conductive RJ-45 termination on one end and non-conductive termination on the other shall be installed from the PoE supply to the field communication device with the conductive termination plugged into the PoE supply. The total length of the Ethernet link over Cat 5e cable shall not exceed 100 meters per IEEE 802.3.

A maximum 1 inch hole shall be drilled in the mounting pole to allow passage of the Cat 5e cable. The hole shall be free of burs and sharp edges prior to the installation of the cable. A weatherproof cable grommet shall be used in the 1 inch hole. The cable shall be attached to the reverse side of the mounting bracket to ensure proper strain relief. The Ethernet cable shall run down the interior of the structure and exit through non-metallic flexible conduit to the communication cabinet. The non-metallic flexible conduit shall be weather sealed on each end to eliminate exterior liquid entry.

The Contractor shall ensure that the installation meets all minimum requirements set forth by the manufacturer in a manner to ensure all work will be covered by the manufacturer's warranty.

The Contractor shall configure the camera with an IP address as provided by the Engineer.

The cameras shall be tested for full functionality and verification of access on the connected network. See project specific Testing & Integration Plan for additional requirements.

The Contractor's installation technician shall have certification by the CCTV manufacturer.

REVISION OF SECTION 614
BREAKAWAY TAPERED ITS STEEL POLE

Section 614 of the Standard Specifications is hereby revised for this Project to include the following:

DESCRIPTION

For this Project, this work shall consist of furnishing and installing the steel tapered pole, breakaway transformer base, and fiber-optic disconnect, as described herein.

MATERIALS

An aluminum transformer base shall be provided which shall conform to breakaway requirements of the American Association of State Highway and Transportation Officials (AASHTO) 2013 Sixth Edition of the Standard Specification for the Supports for Highway Signs, Luminaires and Traffic Signals; and accepted for use by the Federal Highway Administration (FHWA). An aluminum access door and grounding provision with hardware shall be provided in the transformer base. The door opening shall be approximately 11 inches tall, 8.5 inches wide at the top, and 9 inches wide at the bottom. Connecting bolts, flat washers, bearing washers and hex nuts shall be provided with the base assembly. All structural fasteners shall be galvanized high strength carbon steel. All non-structural fasteners shall be galvanized or zinc-plated carbon steel or stainless steel. A satin finish shall be provided unless otherwise requested by the Engineer.

The fiber optic connection to the communications cabinet shall include a breakaway reusable connection system, within the transformer base, which is designed to disengage upon breakaway impact to the steel support pole. This breakaway connection shall be flood resistant, dust proof and waterproof. Connection shall be immediately reusable after breakaway impact, without field repair or re-termination of the fiber optic cable.

Steel Pole shall conform to the following requirements:

(a) *Fabricator.*

The fabricator shall be certified under Conventional Steel Building Structures (SBD) as set forth by the American Institute of Steel Construction (AISC) Quality Certified Fabricators Program. Proof of this certification shall be supplied with the submittal of poles to confirm that the fabricator has the personnel, organization, experience, procedures, knowledge, equipment, capability and commitment to fabricate quality steel pole structures.

(b) *Welding.*

All welding shall be in accordance with Sections 1 through 8 of the American Welding Society (AWS) D1.1 *Structural Welding Code- Steel*. Tackers and welders shall be qualified in accordance with the code. Tube longitudinal seam welds shall be free of cracks and excessive undercut, performed with automatic processes, and be visually inspected.

Longitudinal welds suspected to contain defects shall be magnetic particle inspected. All circumferential butt-welded pole splices shall be ultrasonically or radiographically inspected.

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BREAKAWAY TAPERED ITS STEEL POLE

(c) *Material Certifications.*

All materials and products shall be manufactured in the United States of America, and comply with American Society for Testing and Materials (ASTM) or AASHTO specifications. Mill certifications shall be supplied as proof of compliance with the specifications.

(d) *Pole Shaft.*

The pole shaft should be one piece construction, and shall conform to ASTM A595 with a minimum yield strength of 55 kips per square inch or ASTM A572 with a minimum yield strength of 55 kips per square inch. The shaft shall have a constant linear taper of 0.14 inch per foot, and contain only one longitudinal seam weld. Circumferential welded tube butt splices and laminated tubes are not permitted. Longitudinal seam welds within 6 inches of complete penetration pole to base plate welds shall be complete penetration welds.

(e) *Ground Lug.*

A ground lug shall be provided within the interior base of the pole for connection to a grounding system as specified in Revision of 614 – Grounding and Bonding. A bare copper ground wire shall be provided by the Contractor between the pole's ground lug and a ground rod adjacent to the pole's caisson to provide grounding. The ground wire shall be installed in a dedicated conduit (0.5 inch diameter, minimum) within the pole caisson provided by the Contractor. The Contractor shall bond the ground wire to the pole's ground lug and the ground rod in accordance with the Grounding and Bonding project special provisions.

(f) *Base Plates.*

At a minimum, base plates shall conform to ASTM A36 *Standard Specification for Carbon Structural Steel* or A572 Grade 50. Plates shall be integrally welded to the tubes with a telescopic welded joint or a full penetration butt weld with backup bar. Plates shall be hot dip galvanized per the requirements of the contract documents and finished in accordance with these specifications.

(g) *Anchor Bolts.*

At a minimum, anchor bolts shall conform to the requirements of ASTM F1554 for Grade 55. The upper 12 inches of the bolts shall be hot dip galvanized per ASTM A153. Each anchor bolt shall be supplied with two hex nuts and two flat washers. The strength of the nuts shall equal or exceed the proof load of the bolts.

CONSTRUCTION REQUIREMENTS

All work shall conform to the specifications referenced herein and the current edition of NFPA 70.

Each Breakaway Tapered ITS Steel Pole shall be installed as designed herein. The Contractor shall furnish and install all incidentals necessary to provide a complete working system at each location.

REVISION OF SECTION 614
CCTV POLE WITH LOWERING DEVICE

Section 614 of the Standard Specifications is hereby revised for this Project to include the following:

DESCRIPTION

For this Project, this work shall consist of furnishing and installing the Closed-Circuit Television (CCTV) Internet Protocol (IP) based camera pole(s) and lowering system(s) as described herein.

MATERIALS

Subsection 614.02 shall include the following:

The camera lowering system shall be designed to support and lower an Ethernet (IP-based) CCTV camera, lens, housing, Pan-Tilt-Zoom (PTZ) mechanism, cabling, connectors and other supporting field components without damage or causing degradation of camera operations. The camera lowering system device and the pole are interdependent and shall be considered as single systems. The lowering system shall consist of a steel pole, suspension contact unit, divided support arm, and pole adapter for attachment to a pole top tenon, pole top junction box, conduit mount adapter and camera connection box. The divided support arm and receiver brackets shall be designed to self-align the contact unit with the pole center line during installation and ensure the contact unit cannot twist under high wind conditions. Round support arms will not be accepted. The camera lowering system shall withstand wind forces of 110 mph with a 30 percent gust factor using a 1.65 safety factor. The lowering system manufacturer shall furnish independent laboratory testing documents certifying adherence to the stated wind force criteria utilizing, as a minimum Effective Projected Area (EPA), the actual EPA or an EPA greater than that of the camera system to be attached. The camera lowering system to be furnished shall be the product of manufacturers with a minimum of five years of experience in the successful manufacturing of camera lowering systems. The lowering system provider shall be able to identify a minimum of three previous projects where the proposed system has been installed successfully for over a one-year period of time each.

The lowering system manufacturer shall furnish an authorized factory representative to support the Contractor with the assembly and testing of the first lowering system onto the pole assembly. The manufacturer shall furnish documentation to CDOT certifying that the Contractor has been instructed on the installation, operation and safety features of the lowering system for this specific Project. The Contractor shall be responsible for providing applicable “on site" operational instructions for CDOT maintenance personnel.

(a) *Suspension Contact Unit.*

The suspension contact unit shall have a load capacity 600 pounds with a 4 to 1 safety factor. There shall be a locking mechanism between the fixed and moveable components of the lowering system. The movable assembly shall have a minimum of two latches. This latching mechanism shall securely hold the device and its mounted equipment. The latching mechanism shall operate by alternately raising and lowering the assembly using the winch and lowering cable. When latched, all weight shall be removed from the lowering cable. The fixed unit shall have a heavy duty cast tracking guide and means to allow latching in the same position each time.

The contact unit housing shall be weatherproof with a gasket provided to seal the interior from dust and moisture. The entire unit shall have a minimum temperature rating of -40ºF to +190ºF.

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CCTV POLE WITH LOWERING DEVICE

The prefabricated components of the lift unit support system shall be designed to preclude the lifting cable from contacting the data, power or video cabling. The lowering system manufacturer shall provide a conduit mount adapter for housing the lowering cable. This adapter shall have an interface to allow the connection of a Contractor provided 1.25 inch PVC conduit and be located just below the cable stop block at the back of the lowering system. The Contractor shall supply internal conduit in the pole as directed by the lowering system manufacturer. The only cable permitted to move within the pole or lowering system during lowering or lifting shall be the stainless steel lowering cable. All other cables must remain stable and secure during lowering and lifting operations. Lowering systems for two camera installations shall be configured to not interfere with each other at any time during lowering operations.

The lowering system must be specifically equipped with electrical contacts connectors designed for extreme environmental outdoor use with a CCTV IP camera connected via an outdoor-rated CAT5e Shielded Twisted Pair (STP) cable utilizing Power over Ethernet (PoE).

The female and male socket contact halves of the connector block shall be made of a Underwriters Laboratories (UL) UL 94 *Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances*, V-0 rated thermosetting synthetic rubber. The female barrel contacts and the male pin contacts shall be permanently and integrally encased in this rubber material to ensure protection from moisture and the environment.

All current carrying male pin and female socket/barrel contacts shall be gold-plated per ASTM B488 *Standard Specification for Electrodeposited Coatings of Gold for Engineering Uses* over nickel-plated CA 360 in accordance with SAE International AMSQQN290C *Nickel Plating (Electrodeposited)*. Male contact sizing shall be a minimum of 0.09 inches while the female contacts shall be at least 0.09 inches (inside diameter) at the contact area. All contact shall be a minimum of 0.09 inches in diameter at the contact area. Each individual female barrel contact shall have a nickel-plated CA 360 sleeve that prevents foreign matter from entering the contact area as well as preclude the possibility of the leaves of the female contact from opening beyond allowable limits and ensure a snug fit around the respective male pins. There shall be one contact that is positioned in a manner which will allow it to make first and break last providing optimum grounding performance.

Each Ethernet (IP-based) male-female connector shall include a total of 13 specifically designed contacts. Eight contacts soldered to outdoor-rated CAT5e STP wire end terminated with a shielded RJ-45 male connector and five contacts soldered to #18/1 UL lead wire – bare and numbered 1-5, which may be used for additional camera requirements including but not limited to power, alarms or grounds. All soldering shall be per IPC J STD-001E *Requirements for Soldered Electrical and Electronic Assemblies*. Each individual contact shall be rated for up to 600 volts and 7 amps, but de-rated according to the wire used in the application. For optimum weatherproofing, each male shall be self-wiping with a shoulder at the base of each male contact so that it will recess into the female block, thereby giving a rain-tight seal to each individual contact when mated. Furthermore, the wire leads from both the male and female rubber contact blocks shall be permanently and integrally molded in the synthetic rubber body. The facility manufacturing the electrical contact connector must comply with ISO 9001.

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(b) *Lowering Tool.*

The camera lowering system shall be operated by use of a portable lowering tool. The tool shall consist of a lightweight metal frame and winch assembly with factory spooled stainless steel aircraft cable, a quick release cable connector, an adjustable safety clutch and a variable speed industrial duty electric drill motor. This tool shall be compatible with accessing the support cable through the hand hole of the pole. The lowering tool shall have the capability to be securely attached to the pole with one single bolt. The tool must support itself and the load during lowering and lifting operations. The winch assembly shall include an automatic braking system that provides a means to prevent freewheeling when loaded. One lowering tool per Project shall be delivered to the Department upon Project completion. The lowering tool shall have a reduction gear to reduce the manual effort required to operate the lifting handle to raise and lower a capacity load. The lowering tool shall be provided with an adapter for operating the lowering system by a portable drill using a clutch mechanism. The lowering tool shall be equipped with a positive braking mechanism to secure the cable reel during lifting and lowering operations and prevent freewheeling. The manufacturer shall provide a variable speed, heavy-duty reversible drill motor, clutch and one lowering tool for every five camera lowering system poles provided as part of this Project. The lowering tool shall be made of durable and corrosion resistant materials, powder coated steel, galvanized steel, heavy duty aluminum or otherwise protected from the environment by industry-accepted coatings to withstand exposure to a corrosive environment.

(c) *Camera Junction Box.*

The camera junction box shall be used to provide both a mounting location for the CCTV camera as well as an interface compartment for wire leads from the lowering system to the CCTV camera or applicable surge suppression module. The camera junction box shall consist of a two piece clamshell design with one removable hinge side and one latch side with a single toggle bolt to facilitate easy access. The general shape of the box shall be cylindrical to minimize the effective Projected area. The camera junction box shall be cast aluminum with stabilizing weights on the outside of the box to increase room on the interior. The camera junction box shall be capable of accommodating up to 40 pounds of stabilizing weights. The bottom of the camera junction box shall be drilled and tapped with a 1.5 inch National Pipe Thread (NPT) female thread to accept industry standard dome housings and must include the capability to be modified to accept a wide variety of other camera mountings. The camera junction box shall be gasketed to prevent water intrusion. The bottom of the camera junction box shall incorporate a screened and vented hole to allow airflow and reduce internal condensation.

(d) *Miscellaneous.*

All pulleys for the camera lowering system and portable lowering tool shall have sealed, self-lubricated bearings, oil tight bronze bearings, or sintered oil impregnated bronze bushings. The lowering cable shall be a minimum 0.125 inch diameter stainless steel aircraft cable with a minimum breaking strength of 1,740 pounds.

All electrical and video Ethernet connections between the fixed and lowered portion of the contact block shall be protected from exposure to the weather by both a gasket on the bottom side of the

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CCTV POLE WITH LOWERING DEVICE

bell housing enclosure as well as the "O" ring shoulders at the base of each male contact pin to prevent degradation of the power/signal contacts.

The interface and locking components shall be made of stainless steel or aluminum. All external components of the lowering system shall be made of corrosion resistant materials, powder coated, galvanized, or otherwise protected from the environment by industry-accepted coatings to withstand exposure to a corrosive environment.

In the event any CCTV is not properly weight balanced and plumb, the CCTV camera manufacturer shall provide weights or counterweights as necessary to assure that the alignment of pins and connectors are proper for the camera support to be raised into position without binding.

The CCTV camera manufacturer or Contractor shall provide all applicable power and signal connectors for attachment to the bare leads and shielded RJ-45 male connectors in the pole top and camera junction boxes.

The CCTV camera manufacturer or Contractor shall provide appropriate length of outdoor-rated CAT5e STP (stranded) cable (PoE/signal) in one continuous run from the respective equipment cabinet to the pole top junction box of each lowering system pole.

The caisson foundation shall be in accordance with the CDOT Caisson Foundation Detail for CCTV Pole with Lowering Device.

(e) *Camera Lowering System Pole.*

1. Dimensions and Pipe Wall Thickness

   Steel pole dimensions, wall thickness, and details shall be in accordance with the most recent CDOT Standard Drawing "*CCTV Pole with Lowering Device*".

2. Fabricator

   The fabricator shall be certified under Conventional Steel Building Structures (SBD) as set forth by the American Institute of Steel Construction (AISC) Quality Certified Fabricators Program. Proof of this certification shall be supplied with its pole submittal to ensure that the fabricator has the personnel, organization, experience, procedures, knowledge, equipment, capability and commitment to fabricate quality steel pole structures.

3. Welding

   All welding shall be in accordance with Sections 1 through 8 of the American Welding Society (AWS) AWS D1.1 Structural Welding Code for Steel. Tackers and welders shall be qualified in accordance with the code. Tube longitudinal seam welds shall be free of cracks and excessive undercut, performed with automatic processes, and be visually inspected. Longitudinal welds suspected to contain defects shall be magnetic particle inspected. All circumferential butt-welded pole splices shall be ultrasonically or radiographically inspected.

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4. Material Certifications

All materials and products shall be manufactured in the United States of America, and comply with ASTM or AASHTO specifications. Mill certifications shall be supplied as proof of compliance with the specifications.

5. Pole Shaft

The pole shaft should be one piece construction up to 50 feet in length, and shall conform to ASTM A595 Standard Specification for Steel Tubes, Low Carbon or High-Strength Low-Alloy, Tapered for Structural Use Grade A with a minimum yield strength of 55 kips per square inch or ASTM A572 Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel with a minimum yield strength of 55 kips per square inch. Poles greater than 50 feet in length shall be of multi-piece construction. All structures with pole shaft diameters of 26 inches or less shall be round; pole shaft diameters greater than 26 inches may be round or multi-sided. The shaft shall have a constant linear taper not exceeding 0.14 inch per foot, and contain only one longitudinal seam weld. Circumferential welded tube butt splices and laminated tubes are not permitted. Longitudinal seam welds within 6 inches of complete penetration pole to base plate welds shall be complete penetration welds.

6. Hand Holes for Winch Operation

A single hand hole may be provided in lieu of the dual hand holds detailed. If a single hand hole is detailed, the hand hole opening shall be designed to meet AASHTO fatigue requirements in accordance with the latest interim revisions to the code, and reinforced with a minimum 2 inch wide hot rolled steel rim. The nominal outside dimension of a single hand hole shall be 6 inches by 27 inches. The single hand hole shall have a tapped hole for mounting the portable winch thereto and include a cover. Unless otherwise noted, the bottom lip of the single hand hole shall be located on the shaft between 30 inches to 33 inches from the baseplate.

7. Pole Top Tenon

The pole shall have a custom plate mounted tenon as detailed in the most recent CDOT Standard Drawing "*CCTV Pole with Lowering Device*".

8. Cable Supports/Electrical Cable Guides and Parking Stand (Eyebolts)

Cable supports, Electrical Cable Guides and Parking Stands shall be as detailed in the most recent CDOT Standard Drawing "*CCTV Pole with Lowering Device*".

9. Ground Lug

A ground lug shall be provided within the interior base of the pole for connection to a grounding system conforming to the requirements of Revision 614 – Grounding and Bonding. A bare copper ground wire shall be provided by the Contractor between the pole's ground lug and a ground rod adjacent to the pole's caisson to provide grounding. The ground wire shall be installed in a dedicated conduit (0.5 inch diameter, minimum) within the pole caisson as provided by the Contractor. The Contractor shall bond the ground wire to the pole's ground

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lug and the ground rod. The Contractor shall furnish and install a copper coated steel ground rod (0.625 inch diameter and 8 feet long, minimum) and bond the ground rod to pole's ground lug. The cabinet ground busbar and electrical disconnect (if applicable) shall be bonded to the pole's ground lug through the use of ground wire. The size of the ground wire, bonding methods, and ground rod installation, material and size shall be in conformance with Article 250 of the current edition of National Fire Protection Association (NFPA) 70 National Electric Code (NEC), unless otherwise specified by the Engineer.

10. Base Plates

    At a minimum, base plates shall conform to ASTM A36 Standard Specification for Carbon Structural Steel or A572 Grade 50. Plates shall be integrally welded to the tubes with a telescopic welded joint or a full penetration butt weld with backup bar. Plates shall be hot dip galvanized per the requirements of the contract documents.

11. Anchor Bolts

    At a minimum, anchor bolts shall conform to the requirements of ASTM F1554 Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength Grade 55. The upper 12 inches of the bolts shall be hot dip galvanized per ASTM A153 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware. Each anchor bolt shall be supplied with two hex nuts and two flat washers. The strength of the nuts shall equal or exceed the proof load of the bolts.

CONSTRUCTION REQUIREMENTS

All work shall conform to the specifications referenced herein and the current edition of NFPA 70.

Each CCTV Pole with Lowering Device shall be installed as described herein. The Contractor shall furnish and install all incidentals necessary to provide a complete working system at each location.

See project specific Testing & Integration Plan for additional requirements.

REVISION OF SECTION 614
DEDICATED SHORT RANGE COMMUNICATIONS (DSRC)
ROADSIDE UNIT

Section 614 is hereby added to the Standard Specifications for this project as follows:

DESCRIPTION

The Dedicated Short Range Communications (DSRC) Roadside Unit (RSU) is a short to medium range communications device that provides information and supports Public Safety operations in roadside to vehicle and vehicle to vehicle communication environments. The Roadside Unit is a grade electronic module that must be capable of both transmitting and receiving using DSRC radios, using the 5.9 Gigahertz (GHz) band Approved for DSRC use by the Federal Communications Commission (FCC). DSRC is a two-way wireless communication protocol that integrates and implements the appropriate Institute of Electrical and Electronics Engineers (IEEE), and the Society of Automotive Engineers (SAE) standards (IEEE 802.11p, IEEE 1609 family, and SAE J2735 message set dictionary).

MATERIALS

The RSU shall be enclosed a single enclosed unit with dual radios, powered through the Ethernet Interface. The 5.9.GHz DSRC radios on the board should be connected to the external Antenna 1 and Antenna 2 interfaces. The board contains a main processor running a Linux–based operating system, working in conjunction with additional processors running the DSRC Software Defined Radios. The RSU should have on board Global Positioning System (GPS) for location services and synchronization, a Power Over Ethernet (PoE) or Alternating Current (AC) power source with full surge protection, remote management support, an available software development kit (SDK) for application development, and logging and error reporting.

The RSU shall be shipped with a *Global Navigation Satellite System (*GNSS) antenna and two 5.9GHz omni antennas with external lightning protection.

1. 28±2 dB GNSS antenna
2. 5.9GHz Omni Antenna
3. 0-6 GHz Lightning Surge Protection

The minimum requirements for processing, memory, and storage shall be:

1. Processing: 500 MHZ
2. Memory: 256MB DDR RAM
3. Storage: 8GB compact flash

(a) *RSU Environmental Conditions*.

The RSU shall conform to the following environmental conditions:

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REVISION OF SECTION 614
DEDICATED SHORT RANGE COMMUNICATIONS (DSRC)
ROADSIDE UNIT

1. Operating temperature range: (-40° Celsius to +74° Celsius) (-40° Fahrenheit to +165° Fahrenheit)

2. Storage temperature range: (-45° Celsius to +85° Celsius) (-50° Fahrenheit to +185° Fahrenheit)

3. Operating shock and Vibration: United States Department Of Defense, Military Standard (MIL-STD) 810G, Method 514 and 516

4. Salt fog: United States Department Of Defense, Military Standard (MIL-STD) 810G, Method 509

5. Wind: The roadside unit mounting bracket shall be able to withstand winds up to 110 miles per hour per American Association of State Highway and Transportation Officials (AASHTO) 2013, Sixth Edition of the AASHTO Standard Specification for the Supports for Highway Signs, Luminaires and Traffic Signals, with the most recent Interim Revisions

(b) *RSU Performance*

1. Mean Time Between Failure MTBF: The roadside unit shall remain operational for an average of 200,000 hours under normal environmental conditions.

2. The roadside unit shall meet the operational availability requirements of 99.9%.

3. DSRC Radio Receive Range: The roadside unit shall receive DSRC messages throughout a range of 1m to 300m (1ft to 984ft), with a maximum Packet Error Rate of 10.0%, in an open field under the following conditions:

   A. When receiving on an 802.11p Regulatory class 17 channel (even 10 MHz Service Channel, numbers 172 through 184).

   B. When receiving Part 1 of the SAE J2735 defined Basic Safety Message (BSM)

   C. With a BSM transmit rate of 10 Hz

   D. With a Data Rate of 6 Mbps

   E. With an RSU antenna centerline height of 8 meters

   F. With a maximum BSM transmit Equivalent Isotropically Radiated Power EIRP

4. DSRC Radio Transmission Range: The roadside unit shall transmit DSRC messages throughout a range of 1m to 300m (1ft to 984ft), with a maximum Packet Error Rate of 10.0%, in an open field under the following conditions:

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REVISION OF SECTION 614
DEDICATED SHORT RANGE COMMUNICATIONS (DSRC)
ROADSIDE UNIT

A. When transmitting on an 802.11p Regulatory class 17 channel (even 10 MHz Service Channel, numbers 172 through 184).

B. When transmitting Wave Service Advertisements (WSA), as defined in IEEE 1609.3

C. With a WSA Transmission Rate of 10 Hz

D. With a Data Rate of 6 Mbps

E. Using a receiver conforming to SAE J2945

(c) *RSU Enclosure.*

The enclosure shall be designed to comply with the following NEMA requirements:

1. Providing a degree of protection to personnel against access to hazardous parts (indoor/outdoor use)
2. Provide protection of the equipment inside the enclosure against ingress of solid foreign objects, falling dirt and windblown dust.
3. Provide protection with respect to harmful effects on the equipment due to the ingress of water (rain, sleet, snow, splashing water and hose directed water); and that will be undamaged by the external formation of ice on the enclosure.

The enclosure shall provide:

1. Protection classification: *National Electrical Manufacturers Association (*NEMA) 4X, Ingress Protection (IP) 66 rating
2. Provision for the following waterproof (IP66) connector interfaces
3. One Ethernet RJ45,
   A. IEEE 802.3 10BASE-T, 802.3u 100BASE-TX, PoE 802.3af (Mode A and Mode B)
   B. Input Voltage: 36 to 57Vdc.
   C. Pin Configuration: 3/6, 1/2 or 4/5, 7/8
4. Three N-Type (F) Radio Frequency (RF) connectors (one GNSS and two 5.9GHz connectors)
5. Status Indication: The roadside unit shall include a light-emitting diode (LED) to indicate the operational status of the device in accordance with the following protocol: Off – No Power, Blinking Green – Device Start-Up, Solid Green - Device Operational, Amber - Firmware Update in Progress, Red-Fault
6. Multipin Digital Interface (Serial Console)

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7. The external PoE connector shall be compliant with the Outdoor IP66 rating.

8. Internal heat spreader

9. Die-cast Aluminum with a Powder-Coat finish and complete set of mounting holes to suit the particular PCB variant.

(d) *RSU Board.*

The Board shall be designed to provide a compact platform for the deployment of advanced connected vehicle applications and protocol stacks to enhance the performance of the DSRC Radio in mobile environments.

The Board shall provide:

1. Single or Dual channel IEEE 802.11p radio

2. IEEE 1609.1-4 protocol stacks, including security functions

3. Advanced vehicle positioning system, including

   A. Advanced GNSS positioning system

   B. Optional Dead Reckoning (DR) using vehicle sensors via Controller Area Network (CAN) bus or VIC inputs

4. High performance application processor for execution of ITS and safety applications

   A. Processor

   B. DDR memory

   C. Linux operating system

5. Interface options

   A. Ethernet Internet Protocol Version(IP v)4/IPv6 networking)

   B. Universal Serial Bus (USB) 2.0 high-speed, on-the-go (host/peripheral)

   C. Serial Console (Internal)

   D. High speed CAN bus interface on VIC connector

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The Application Processor should run the latest Linux operating system, and ITS applications should be written as Linux application software. Non-volatile (flash memory) storage is accessible via standard Linux file-systems, and user interface devices are accessed via standard Linux Application Programming Interface (API).

(e) *DSRC Radio Transceiver.*

The DSRC radio should be comprised of the following components; Physical Layer Radio Transceiver (PHY), RF, and Medium Access Control (MAC) as described below:

1. Physical Layer Radio Transceiver (PHY).

The physical layer radio transceiver (PHY) shall be IEEE 802.11p compliant which employs advanced mobility receiver algorithms. The PHY RF front-end must provide multiple radio configurations, allowing the Carrier Board to implement single or dual radio DSRC systems.

The RF sub-system provides separate antenna ports for 5GHz bands.

The PHY shall provide 2-antenna diversity transmission and reception for optimum radio performance. The required operating modes and functionality of the PHY are as follows:

A. Single-channel mode for (1 or 2 antenna diversity operation) and dual-channel mode (1 antenna per channel), 2 independent IEEE 802.11p for radios operating on different radio channels.

B. 10MHz, (DSRC) channel bandwidth modes.

C. Dual five GHz RF paths (5.18 GHz to 5.93 GHz)

D. Transmit mask meeting IEEE 802.11p Class C (5GHz band).

E. IEEE 802.11p enhanced adjacent channel receiver performance.

F. Transmit antenna cyclic delay diversity (2 antenna operation only).

2. Medium Access Control Layer.

The MAC shall be IEEE 802.11p compliant and provide fast, time-synchronized channel switching functionality. It should also provide support for multiple queue sets, allowing packets to be queued while the PHY/MAC is operating on another channel.

The MAC shall provide the following operating modes:

A. Channel switching between 2 channels with independent sets of transmit queues.

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B. Single radio, time-synchronized multi-channel operation

C. Simple single radio channel operation

D. Dual-radio, multi-channel operation

E. Independent MAC/PHY entities operating concurrently on different radio channels.

F. Optional coordination between channels to avoid self-interference when operating on close radio channels.

G. Dual radio time synchronized multichannel operation.

Other features of the MAC should include Radio Channel Measurements, comprising the following:

A. Channel utilization (ratio of channel busy time to measurement duration)

B. Channel active ratio (proportion of time that the radio is tuned to the Service Channel (SCH) or Control Channel (CCH), respectively)

C. Per-channel statistics (number of packets successfully transmitted, number of packets that failed to transmit, number of packets successfully received, and number of packets received in error. Broken down according to broadcast, multicast, and unicast packets).

D. Received signal and noise power levels

3. Processor.

The processor shall utilize the Linux operating system and provide flexibility for running multiple applications. The processor shall provide ample processing power for the ITS applications.

A wide selection of services available to applications should be provided, not limited to the following:

A. Communication services.

The system shall provide a range of communication services for ITS applications. All communication services should be integrated within the Linux networking system. The following network protocols should be provided by the platform:

(1) IPv6, IPv4 (Linux networking stack)

(2) IEEE1609.3 (WAVE) Short Message Protocol WSMP and (WAVE) Management Entity WME management

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(3) European Telecommunications Standards Institute (ETSI) TC-ITS GeoNetworking (GN, GN6) and Basic Transport Protocol (BTP)

These communication protocols should have the capability to operate over the following communication interfaces available on the Unit board namely 10/100Mbps Ethernet and USB 2.0.

B. Ethernet.

The Unit processor shall provide a 100Mbps Ethernet interface (10BASE-T/100BASE-TX) which can be used as part of an application or alternatively used for debugging purposes or remote status and control. The Ethernet interface should be supported by Linux Ethernet device drivers, providing full IPv4/IPv6 over-Ethernet networking functionality.

C. Peripheral Interface Services.

General purpose interface services should be provided to allow interconnection with external peripheral devices and systems.

D. USB-OTG.

A USB 2.0 on-the-go (OTG) port should be available on the Unit Board, and shall be supported by Linux USB host and peripheral device driver APIs.

E. Serial Console.

The Unit Board may provide an optional serial port upgrade via the expansion connector through which the primary operating system console becomes available.

This port should be used primarily for system development and debug operations, but may also be used by applications.

F. Security Services

The Unit Board shall provide hardware security services necessary to support the IEEE 1609.2 and ETSI TS 102 867 standards.

G. Add of field and/or remote upgrade feature to allow messages sets, firmware, application updates.

(f) *Certification Requirements.*

The Roadside Unit must conform to the US Department of Transportations' "DSRC Roadside Unit Specifications Document, version 4.1 and OmniAir certifications. OmniAir certification

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incorporates specific Wi-Fi and FCC requirements. To ensure conformance with DOT standards, the selected vendor should be on the United States Department of Transportation (USDOT) Research Qualified Products List (rQPL).

(g) *System Software Requirements*.

The RSU software is an application that will run on Wireless DSRC radios. The RSU software shall be able to perform the following requirements, at a minimum:

1. Broadcast SAE J2735 messages over the DSRC radio
2. Receive Wave Short Messages (WSM)
3. Route and forward IPv6 traffic for connected mobile units
4. Capture Communication Message Log (CML)
5. Capture System Status Log (SSL)
6. Transmit periodic heartbeat messages

(h) *Software Environment*.

The software environment shall be a Linux-based operating system which utilizes both Python and C-based components, or other equipment components which perform the requirements.

(i) *Ethernet Interface*.

The RSU software running on the DSRC radio utilizes the Ethernet interface to combine functions of both the Remote System interface (RSI) and the Local System Interface (LSI). This interface shall be able to perform the following requirements, at a minimum:

1. Successfully login to the RSU with the ability to start and stop the application and set configuration parameters
2. The ability to add, delete and modify active list messages
3. Transmit unicast heartbeat messages to a remote host
4. Accept SAE J2735 messages for immediate forwarding on the DSRC radio interface
5. Off-loading log messages about system status and communication history of the device.

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(j) Summary of Software Operation.

The RSU software shall run on Wireless DSRC radio units and perform the following functions, at a minimum:

1. Broadcast SAE J2735 messages on the DSRC radio interface and monitor for forwarded SAE J2735 messages on its Ethernet interface to broadcast on the DSRC radio interface.

2. Log transmitted and received messages on DSRC radio interface (CML)

3. Log system status messages (System Status Log)

4. Receive Wave Short Messages (WSM)

5. Transmit Wave Service Announcements (WSA)

6. Route IPv6 traffic for connected mobile units

7. Transmit periodic heartbeat messages

8. Ensure message signing and verification in accordance with IEEE 1609.2 requirements.

(k) System Interfaces.

A brief description of these interfaces is provided below:

Interfacee	Description
Antenna 1 / 2	5.9 GHz N-Type Male for DSRC radio
LED	Multi-color Light Emitting Diode (LED)
USB	USB Type A female
Digital Interface	Ingress Protection rated connector providing RS232 serial
Ethernet	Ethernet socket with Power over Ethernet
GNSS Antenna	Global Navigation Satellite antenna connector (N-Type Male connector)

(l) DSRC Antenna Interfaces.

1. The RSU provides a single DSRC radio set, denoted by interfaces Antenna 1 and ANT2.

   A. USB Interface

   The USB interface shall be an IP66/IP67 rated USB-Type A Female connector with a threaded collar to provide a tight seal against water and dust.

   B. Ethernet Interface.

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The Ethernet socket takes a RJ45 plug and connects to an internal Power over Ethernet Splitter providing separate power and Ethernet to the board. The internal PoE splitter is configured to support 802.3af Mode A/B.

C. GNSS Interface.

The RSU provides a GNSS interface to receive global positioning data transmitted by satellites.

(m) Connected Vehicle Applications.

Dedicated Short Range Communications has evolved significantly over the last 20 years. It is expected that the installed roadside units shall have the capability and flexibility to be integrated with various mobility, safety, and data applications within the Colorado Department of Transportation.

CONSTRUCTION REQUIREMENTS

(a) Installation Requirements.

1. Powering the Roadside Unit (RSU)

The PoE splitter, internal to the RSU, shall be configured to connect to a PoE (802.3af) Mode A/B Power Supply Equipment (PSE), supplying 48V DC or 110VAC over the Ethernet interface. If the installation site does not support 802.3af, then an additional PoE Injector taking DC input and supplying 48V DC 802.3af Mode A/B output will be required to power the unit. The maximum distance between the PSE and the Powered Device (PD), and the RSU, shall be 100 meters (328 feet). Providing power beyond 100 meters requires an additional PoE extender. Power consumption for the RSU shall not exceed 24 Watts.

2. RSU Antenna Connections.

The RSU requires Omni-directional antenna connected to each DSRC radio and a Global Positioning System (GPS) Antenna connected to the GNSS interface. All Radio Frequency (RF) connectors and lightning surge arresters shall be weatherproofed with self-fusing rubber tape.

3. Lightning Surge Arresters.

The DSRC radios and GNSS receiver on the RSU can be protected by attaching optional Lightning Surge Arresters. If lightning surge arresters are to be fitted, they must be connected directly to the RSU Antenna 1, Antenna 2 and GNSS interfaces. All lightning surge arresters shall be connected to a common earthing/grounding point. An earth grounding wire must be

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attached to the body of each lightning surge arrester. The earth grounding wires should be connected to same common earth ground point used by the RSU.

4. Omni Directional Antenna.

   An optional Lightning Surge Arrester can be connected in-line with each DSRC radio. An earth grounding wire must be attached to the body of each lightning surge arrester. The earth grounding wires are connected to same common earth ground point used by the RSU. The RSU requires Omni-directional antenna connected to each DSRC radio and a Global Positioning System (GPS) Antenna connected to the GNSS interface. All Radio Frequency (RF) connectors and lightning surge arresters shall be weatherproofed with self-fusing rubber tape.

5. Pole Mounting.

   The RSU shall have a flat surface, with equally spaced mounting holes and is capable of accepting an optional mounting bracket. The mounting bracket should be attached to facilitate mounting to a vertical or horizontal pole. Adjustable stainless steel straps can be threaded through slots in the mounting bracket to fasten the mounting bracket to the pole. When attaching an RSU to a horizontal pole, the minimum recommended separation between the pole and the Antenna closest to the pole is 2 meters (6.56 feet). For vertical mounting of an RSU, the mounting height of the RSU unit and varies based on roadway topology and ensuring the optimal line of sight.

(b) DSRC Radio Interface.

The RSU software running on the DSRC radio shall utilize the DSRC Radio interface to broadcast SAE J2735 messages, transmit Wave Service Announcements (WSA), traveler information messages, Radio Technical Commission for Maritime Services (RTCM) messages, and Geometric Intersection Description (GID)/MAP messages. Dual Radio support must be provided. The following networking support is required, namely:

1. IPv6
2. IPv4
3. Simple Internet Transition (SIT) Tunnel Support
4. System Status Log (SSL)
5. Secure Shell (SSH)
6. *Transport Layer Security* (TLS)

(c) Software installation

The RSU *s*oftware shall run on Wireless DSRC radio units and incorporate field-proven Network Layer, Facilities Layer, and Applications Layer software libraries. In addition, the SDK shall allow users to develop their own applications and customize the system.

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DEDICATED SHORT RANGE COMMUNICATIONS (DSRC)
ROADSIDE UNIT

All DSRC radios/RSU *s*oftware on this project shall include licensing for centralized manufacturer management software capable of remote device discovery, real-time device monitoring, troubleshooting, diagnostics, and automated configuration management

REVISION OF SECTION 614
FOLD-OVER TOWER (ITS)

Section 614 of the Standard Specifications is hereby revised to include the following:

DESCRIPTION

This work consists of furnishing and installing a heavy duty fold over tower, base assembly, concrete footing, concrete pad, conduit sweeps, pull boxes, chain link fencing and chain link gate at the locations shown on the Plans. The tower will be used to install road weather information systems (RWIS) and other ITS equipment.

MATERIALS

The heavy duty fold over tower and base assembly shall be a Heavy Duty Fold over Tower – Model MF 1333, 30 feet in height as supplied by Glen Martin Engineering, Inc., 13620 Old Hwy 40, Boonville, MO., 65233, (660) 882-2734. (www.glenmartin.com) or Approved equal.

Concrete footing shall be Concrete Class BZ and shall be in accordance with Section 601.

Concrete pad shall be Concrete Class B and shall be in accordance with Section 601.

Chain link fencing shall be a minimum of 6 feet in height when measured from ground surface. The gate for the chain link fence shall be between 3.5 feet and 4 feet in width, and shall include locking hasps and end caps. Materials for chain link fencing shall conform to CDOT Standard Plan M-607-2, latest version.

Conduit shall conform to Section 613 – Electrical Conduit

Pull boxes shall conform to Section 613 – Pull Boxes.

The Contractor shall supply six ½ inch diameter, 10 foot copper clad ground rods and ¾ inch acorn ground rod clamps.

CONSTRUCTION REQUIREMENTS

Contractor shall install heavy duty fold over tower and base assembly shall be installed in accordance with the details shown in the Plans per manufacturer's recommendations. The Contractor shall install the tower such that it will not become an obstruction or hazard when raised, lowered, or in the fold down state. The Contractor shall form and pour the tower footing per the Project detail included with the Project and in accordance with manufacturer recommendations. The Contractor shall install and cap conduit sweeps before pouring the footing.

A 5 foot wide by 6 foot long by 4 inch deep concrete pad shall be formed and poured after the tower footing has been installed. The Contractor shall set the pull boxes shown on the Project details and pour the pad around the pull boxes. All incoming conduits shall be installed under the concrete pad and shall be coupled to the conduits installed in the footing as required.

The Contractor shall install chain link fencing around the outside perimeter of the concrete pad. The chain link fence shall be installed from between 6 inches and 2 feet from the edge of concrete pad along the entire perimeter of the pad. The chain link gate shall be installed at the center opposite the hinged side of the tower and in a location that allows the tower to be folded down through the open gate.

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REVISION OF SECTION 614
FOLD-OVER TOWER (ITS)

The Contractor shall make all arrangements for a qualified manufacturer's representative to be on-site to ensure proper installation. The Contractor shall perform an acceptance test procedure for approval and acceptance by the Department and in the presence a representative of the CDOT ITS department. The acceptance test shall include demonstrating the tower raises and lowers according to the manufacturer's design and is fully functional at completion.

REVISION OF SECTION 614
WEATHER MONITORING SYSTEM

Section 614 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

This work consists of furnishing, installing, and commissioning a weather monitoring station (WMS) at the locations shown on the Plans.

The WMS shall be specifically designed to monitor and collect real time atmospheric and pavement conditions along with color still frame video images of the roadway. The WMS shall be capable of sending this information to a centralized computer system compatible with existing CDOT ITS infrastructure. CDOT's centralized weather management server will poll the WMS to ask for data on a preset time interval specified by CDOT to transfer and refresh with current conditions. Data from the WMS shall comply with standard National Transportation Communications for Intelligent Transportation System Protocol (NTCIP).

The Contractor shall provide a detailed description (technical cut sheets) of the WMS to be supplied and the experience of the vendor/manufacturer in supplying such WMS to other agencies. The Contractor shall also provide written justification of the selection process used in the selection of a WMS vendor/manufacturer. Such justification shall assure that CDOT receives a state of the art WMS from a responsible vendor/manufacturer that is compatible with the existing statewide WMS system currently in place. CDOT may require the Contractor to document the proposed WMS can provide interoperability and connectivity to the existing statewide WMS system. The WMS equipment vendor chosen by the contractor must have at least ten successful WMS installations in North America. As part of the equipment approval process, CDOT may ask the Contractor to provide the names of at least three agencies, with names, telephone numbers and contact person to verify said WMS installations were successful.

After completion of the equipment installation, the equipment manufacturer representative shall perform all final system checks, sensor alignments, software setup, and software configuration to provide a fully operational WMS. The equipment vender shall provide a limited, on-site warranty covering all equipment for a 12-month period from the WMS commissioning date.

MATERIALS

The WMS shall include a remote processing unit, a precipitation occurence sensor, an air temperature/relative humidity sensor, a wind sensor/s, wired road surface sensors, a wired sub-surface sensor, a non-intrusive road surface condition sensor, a pan-tilt-zoom camera, and all mounting and attachment hardware, cables, test equipment, and manufacturer site commissioning necessary for a full and complete installation.

(a) *Remote Processing Unit (RPU).*

The RPU shall gather, process, and store data from all connected atmospheric sensors, pavement sensors and camera. The data shall be transmited to CDOT's centralized weather management servers upon polled request via NTCIP ESS protocol. The RPU shall utilize a modular design consisting of a main data processing unit and secondary communication units that are used to power

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WEATHER MONITORING SYSTEM

and connect sensors at the WMS site. The main data processing unit shall utilize a Reduced Instruction Set Computing (RISC) type processor and run a Linux based operating system capable of multi-tasking operations that optimizes data acquisition from all connected devices. The RPU shall include in-built GPS for real-time clock synchronization and location definition.

The RPU shall support standardized communication protocols for sensors from various manufactures.

The RPU shall also have the capability to be reset from the centralized server. The RPU shall include a minimum of two 10/100 Ethernet ports, six serial ports configurable for RS-232 or RS-422/485 operating at full or half duplex from 300 to 115,200 bits per second. All circuitry of the RPU, the voltage inputs, the sensor inputs, and the communications ports shall be designed and tested to provide transient voltage and surge protection. The RPU shall include lightning protection for all channels and serial ports including auto-reset circuit breakers for power. The RPU shall operate in a range of100 to130 volts alternating current (VAC) at 55 to 65 hertz (Hz) and shall use not more than 60 watts of continuous power.

The RPU shall have the capability of being modified to utilize solar power and other power sources in place of conventional commercial electric power. Solar powered RPU sites shall operate a minimum of 72 hours without sunlight or solar charging of the batteries. A solar powered RPU shall operate within a power range of 12-32 VDC.

All RPU electronics shall be capable of operation over a minimum temperature range of -40°F to 160°F and 0 percent to 90 percent relative humidity non-condensing. The RPU shall support full site configuration and management via a web based user interface for on-site and remote access. The RPU shall be capable of communication to the centralized server via serial RS-232/422/485 utilizing point to point protocol (PPP) or point to multi-point protocol (PMPP) or 10/100 Ethernet connection utilizing Transmission Control Protocol/Internet Protocol (TCP/IP). The RPU hardware and software provided shall be compliant with the most current Federal standard National Transportation Communications for ITS (NTCIP) Environmental Sensor Station (ESS) communication protocols.

At minimum the RPU shall be capable of collecting data from the following:

1. one wired precipitation type sensor
2. one wired air temperature/relative humidity sensor
3. four wired road surface sensors
4. one wired wind speed/direction sensor
5. two non-intrusive pavement condition sensor
6. two non-intrusive pavement temperature sensor
7. one wired pan-tilt-zoom camera

The RPU shall include an IP66 rated lockable stainless steel AISI 316 powder coated enclosure that is resistant to weather, sunshine, de-icing chemicals, corrosion and damage from falling debris (ice, small rocks and tree branches) and vandalism. The enclosure shall be capable of being mounted on poles with an outer diameter range of 6 inches to 24 inches or EFS fold-over tower and have rubber flanges located at the bottom which provides cabling access. The enclosure shall house all RPU

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REVISION OF SECTION 614
WEATHER MONITORING SYSTEM

electronics, power supplies, and communication equipment and not exceed dimensions of 24 inches height by 20 inches width by 8.25 inches depth.

(b) *Precipitation Type Sensor.*

The precipitation sensor shall utilize optical, infrared technology to detect precipitation with beam interruptions by precipitation particles. The precipitation type sensor shall sense the onset and cessation of precipitation in the form of rain, snow, sleet, and freezing rain and shall indicate when precipitation is occurring. The sensor shall provide all precipitation classification, measurements of intensity or water accumulation, as well as visibility. It shall provide proper operation over a minimum temperature range of -40°F to 140°F at 0 to 100% RH and also meet an IP66 rating. The sensor shall operate to specifications at cable lengths up to 100 feet from the RPU.

The sensor shall operate within a power range of 12–30 VDC and use no more than 5 watts of power. The sensor shall include RS-232, RS-485 data communication, and 4 to 20 mA outputs; and be capable of operating to specifications a cable lengths up to 100ft from the RPU.

Communication and power cable connecting the sensor to the RPU shall be shielded, with UV stable jacket rated for outdoor use. The Contractor is responsible for providing the correct length cable based on the planned installation.

(c) *Air Temperature/Relative Humidity Sensor.*

The Air Temperature/Relative Humidity Sensor shall accurately measure outside ambient air temperature and relative humidity. The sensor shall include an air temperature-sensing element that measures temperatures within a minimum range of -40°F to 140°F with an accuracy within 1 degree of actual temperature. The sensor shall include a relative humidity sensing element that measures a range from 0 to 100 percent relative humidity within 1% of actual humidity levels. System dew point temperature shall be calculated from the air temperature and relative humidity. The sensor shall be protected by UV stabilized white thermoplastic solar/wind-radiation shield and meet IP66 rating.

The sensor shall operate within a power range of 7–30 VDC and use no more than 5 watts of power. The sensor shall include RS-485 2 wire serial data communication, 0 to 10 voltage, and resistance level outputs;and be capable of operating to specifications on cable lengths up to 100 feet from the RPU.

Communication and power cable connecting the combined sensor to the RPU shall be shielded, with UV stable jacket rated for outdoor use. The Contractor is responsible for providing the correct length cable based on the planned installation.

The sensor shall include all mounting hardware necessary to complete the installation.

(d) *Wind Speed/Direction Sensor.*

The wind speed/direction sensor shall accurately measure wind speed and direction without moving parts. The sensor shall be corrosion resistant and satisfy IP66 and IP67 ratings. The sensor shall

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WEATHER MONITORING SYSTEM

include both 0 to 5000 millivolt analog and RS-232/RS-485 digital outputs. The sensor shall have an operating range of 0 to 145 miles per hour, with a survival operation limit of 190 miles per hour. Accuracy for measured wind speed shall be less than 3 percent of actual wind speed. Wind speed direction operating azimuth shall be measurable from 0 to 360 degrees, with an accuracy of +/- 2 degrees, and resolution of 1 degree. The minimum operating temperature range shall be -40°F to 140°F. The sensor shall include provisions to deter animal perching and nesting.

The sensor shall operate within a power range of 9-40 VDC and use no more than 30 watts of power. The sensor shall include both 0 to 5000 mV analog and RS-232/RS-485 digital outputs; and be capable of operating to specification on cable lengths up to 30 feet from the RPU.

The sensor shall include all mounting hardware necessary to complete the installation.

(e) *Wired Road Surface Sensors.*

The wired road surface sensor shall be a single passive solid-state electronic device that is capable of detecting:

(1) Road surface temperature as measured from the top of the sensor from -40°F to 175°F.

(2) Moisture presence on road surface 32°F (0°C)

(3) Depth of moisture on roadway from 0.12 to 0.50 inches

(4) Road moisture conductance for determining chemical presence.

The sensor shall be designed for mounting in the roadway for accurate measurement, without interfering with vehicle travel. The sensor shall be constructed of materials that have thermal characteristics similar to common pavement materials and approximate the roadway pavement color and texture. The sensor shall be manufactured with an integrated pre-attached cable up to 300 feet long for connection to the RPU. The sensor shall operate to specification at cable lengths up to 5,000 feet from the RPU.

The sensor shall be compatible with the RPU provided and shall supply data for calculating, freezing point temperature of roadway moisture, ice-control-chemical solution percentage for commonly used ice-control-chemicals, and road surface conditions including wet, dry, snow, and ice. The quantity of wired road surface sensors and desired sensor detection locations shall be provided on the Plans and Approved by the Department.

(f) *Wired Sub-Surface Sensor.*

The wired sub-surface sensor shall be a single passive solid-state electronic device that is capable of detecting ground temperature from -40 to 120 °F at a minimum depth of 18 inches. The sensor shall be compatible with the RPU provided. The sensor shall be manufactured with an integrated pre-attached cable up to 300 feet long for connection to the RPU.

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WEATHER MONITORING SYSTEM

(g) *Non-Intrusive Pavement Condition Sensors.*

The non-intrusive pavement condition sensor shall utilize Class 1 laser technology to accurately differentiate and measure presence of water, ice, slush, snow, and frost. The sensor shall also measure the level of grip and friction coefficient of the roadway. The sensor shall be capable of accurate measurements within a minimum range of 7-50 feet. The sensor shall operate in a minimum temperature range of -40 to 140 °F at 0 to 100 percent relative humidity.

The sensor shall operate within a power range from a 9 to 30 volt direct current (VDC) and use no more than 4 watts of power. The sensor shall provide RS-232 and RS-485 serial data communication interfaces and be capable of operation on cable lengths up to 300 feet from the RPU.

If the WMS tower is greater than 25 feet from the white edge line of the roadway being measured, then the non-intrusive pavement condition sensor shall include breakaway pole and underground conduit to install the sensor at an appropriate height to detect conditions in the closest lane of travel.

Communication and power cable connecting the sensor to the RPU shall be shielded, with UV stable jacket rated for outdoor use. The Contractor is responsible for ordering the correct cable length based on planned installation.

The sensor shall include all mounting hardware necessary to complete the installation.

The quantity of non-intrusive pavement condition sensors and desired sensor detection location shall be provided on the Plans and Approved by the Department.

(h) *Non-Intrusive Pavement Temperature Sensors.*

The non-intrusive pavement temperature sensor shall use infrared technology to accurately measure road surface temperature. The sensor shall be capable of accurate measurements within a minimum range of 7 to50 feet. The sensor shall operate in a minimum temperature range of -40 to 140 °F at 0 to 100 percent relative humidity. The sensor shall be powered from a 9 to 30 VDC source and use no more than 0.05 watts of power. The sensor shall provide RS-232 and RS-485 serial data communication interfaces and be capable of operation on cable lengths up to 300 feet from the RPU.

If the WMS tower is greater than 25 feet from the white edge line of the roadway being measured, then the non-intrusive pavement temperature sensor shall include breakaway pole and underground conduit to install the sensor at an appropriate height to detect road temperature in the closest lane of travel.

Communication and power cable connecting the sensor to the RPU shall be shielded, with UV stable jacket rated for outdoor use. The Contractor is responsible for ordering the correct cable length based on planned installation.

The sensor shall include all mounting hardware necessary to complete the installation.

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The quantity of non-intrusive pavement temperature sensors and desired sensor detection location shall be provided on the Plans and Approved by the Department.

(i) *Pan-Tilt-Zoom Camera.*

The camera shall have pan, tilt, and zoom functionality and shall be enclosed in a sealed, environmentally controlled dome housing designed to operate in 100 percent humidity at a minimum operating temperature of -40° to 122°F. The camera housing shall carry both IP66 and NEMA 4x ratings. The camera shall utilize a 100 megabits per second 802.3 Ethernet connection for native communications and be powered from an 802.3at compliant Power over Ethernet (PoE) supply. The camera shall be able to display multiple individually configurable video streams up to 30 frames per second in high definition resolutions from 1920x1080 to 320x180 at a 16:9 aspect ratio in H.264 and MJPEG formats. The camera shall allow for onscreen titling, image overlay, and capture of at least 256 presets views. It shall include electronic image stabilization and the ability to reduce effects of rain & fog in picture. The camera shall have an internal web interface for configuration with security functionality allowing multiple user access levels with password protection. The camera shall also be capable of using stream authentication for video security with a minimum of 20 access accounts. Edge storage shall also be available via Secure Digital (SD) memory slot. The camera shall be capable of video analytics via onboard or installable applications. The camera shall support IPv4/v6, HTTP, HTTPS, SSL/TSL, QOS Layer 3 DiffServ, FTP, SMTP, SNMP v1/2/3, UpnP, DNS, DDNS, NTP, RTSP, TCP, UDP, IGMP, RTCP, ARP, and SOCKS.

Technical specifications for the camera shall be as follows:

(1) The lens shall be f=4.45 to 142.6 millimeter, F1.6 to 4.41, autofocus; focus range of 35 millimeter (wide) to 800 millimeter (telephoto) to infinity, with 62.98 degree to 2.23 degree horizontal angle of view.

(2) Minimum illumination color 0.3 lux at 30 IRE F1.6 and black and white 0.03 lux at 30 IRE F1.6

(3) Shutter speed shall be variable from 1/33,000 to 0.25 seconds at 60 hertz.

(4) The pan, tilt, and zoom function shall provide 360 degrees of continuous pan rotation at 0.05 to 450 degrees per second, a 220 degree tilt range allowing for a 20 degree view above the horizon at 0.05 to 450 degrees per second, and minimum 32 times optical zoom and 12 times digital zoom.

CONSTRUCTION REQUIREMENTS

The Contractor shall install the WMS in accordance with the WMS vendor's recommendations, CDOT plans and Standard Specifications and all federal, state and local codes and requirements. The Contractor will be responsible for providing all traffic control and safety work zones for the installation of the roadway sensors in accordance with CDOT traffic control requirements.

The Contractor shall install a 120 volts alternating current (VAC) electrical supply from the power source shown on the plans to a location near the RPU. The Contractor shall connect the 120 VAC service to the

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WEATHER MONITORING SYSTEM

RPU power disconnects. The primary power shall be connected to the RPU with resettable overcurrent protection rated for 20 amps and voltage surge protection. Replacement and installation of RPU and sensors at existing locations shall be powered via uninterrupted power supply (UPS) when available.

The Contractor shall install the RPU electronics enclosure on the fold over tower per manufacturer recommendations.

The precipitation type sensor shall be mounted on the WMS tower per manufacturer's recommendations above ground level at the RPU. The sensor shall be configured and calibrated to function as designed with the RPU.

The air temperature/relative humidity sensor shall be mounted on the WMS tower per manufacturer's recommendations at the standard meteorological height of approximately 6 feet above ground level in a ultraviolet (UV) stabilized white thermoplastic solar radiation/wind-shield.

The wind sensor shall be mounted on top of the WMS tower per manufacturer's recommendations at the standard meteorological height of approximately 30 feet above ground level. The sensor shall be mounted such that birds are not able to perch or nest on the sensor. The sensor shall be configured and calibrated to function as designed with the RPU.

The wired road surface sensor shall be installed per manufacturer's recommendations after the top layer of all road resurfacing has been completed. Exact placement of the sensor shall be as determined by the Project Engineer, or Plans with guidance from the manufacturer. All cabling for the sensor, where it is not embedded in the road, shall be installed in conduit at a minimum depth of 36 inches. Installation shall be done in a manner to eliminate all cable splicing. The sensor shall be configured and calibrated to function as designed with the RPU.

The wired sub-surface sensor shall be installed per manufacturer's recommendations to detect temperature at a depth of 18 inches. Exact placement of the sensor shall be as determined by the Project Engineer with guidance from the manufacturer. All cabling for the sensor, where it is not embedded in the road, shall be installed in conduit at a minimum depth of 36 inches. Installation shall be done in a manner to eliminate all cable splicing. The sensor shall be configured and calibrated to function as designed with the RPU.

The non-intrusive pavement condition sensor shall be mounted on the WMS tower per manufacturer's recommendations at a height and angle that will allow measurement of the middle of the closest lane of travel. If the WMS tower is greater than 25 feet from the white edge line of the roadway being measured, then the non-intrusive conditions and temperature sensors shall be mounted on a breakaway pole installed 15 feet from the same white edge line. Conduit and pull boxes shall be installed between the WMS tower and fiberglass pole to connect the sensor to the WMS RPU.

The non-intrusive pavement temperature sensor shall be mounted on the WMS tower per manufacturer's recommendations at a height and angle that will allow measurement of the middle of the closest lane of travel. The Contractor is responsible for using the appropriate communication protocol based on RPU to sensor connection to maximize communications reliability.

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WEATHER MONITORING SYSTEM

The pan-tilt-zoom camera shall be installed per manufacturer recommendations on the WMS tower approximately 3 ft below the top of the structure, and configured for a minimum of two preset positions as determined by the Project Engineer.

All sensor and camera cables connecting to the RPU shall be secured to themselves and the structure every three ft. Cables for all sensors and camera shall enter through the bottom of the RPU enclosure be labeled by sensor type and location where applicable, and connect to the appropriate port on the RPU.

The Contractor is responsible for connecting the WMS RPU to communication infrastructure provided by the project where applicable.

After completion of the equipment installation, the equipment manufacturer representative shall perform all final system checks, sensor alignment and calibration, sensor setup, RPU configuration including site communication setup, software setup, and central server configuration to provide a fully operational WMS. If Contractor requests remote configuration via VPN, contractor shall complete and submit CDOT access form four (4) weeks in advance for approval.

All associated hardware required for a complete installation is considered subsidiary and is and shall be included as part of the work.

REVISION OF SECTION 614
ENVIRONMENTAL FRICTION SYSTEM

Section 614 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

This work consists of furnishing, installing, and commissioning an environmental friction system (EFS). The EFS shall be specifically designed to collect and distribute real time atmospheric and roadway pavement conditions to a centralized computer system compatible with existing Colorado Department of Transportation (CDOT) ITS infrastructure. CDOT's centralized weather management server will poll the EFS for data on preset time intervals, from two to ten minutes, to transfer and update with current conditions. Data from the EFS shall comply with standard National Transportation Communications for Intelligent Transportation System Protocol (NTCIP).

The Contractor shall submit detailed descriptions (technical cut sheets) of all components comprising the EFS; along with vendor/manufacturer experience in supplying and installing EFS to CDOT or other agencies. The Contractor shall also provide written justification of the selection process used in the selection of an EFS vendor/manufacturer. Such justification shall assure that CDOT receives a state of the art EFS from a responsible vendor/manufacturer that is compatible with the existing statewide system currently in place. CDOT may require the Contractor to document the proposed EFS can provide interoperability and connectivity to the existing statewide EFS system. The EFS equipment vendor chosen by the Contractor must have at least ten (10) successful EFS installations in North America. As part of the equipment approval process, CDOT may ask the Contractor to provide contact information from at least three (3) other agencies to verify said EFS installations were successful.

After completion of the equipment installation, the equipment manufacturer representative shall perform all final system checks, sensor alignments, software setup, and software configuration to provide a fully operational environmental friction system.

MATERIALS

The EFS shall include a remote processing unit, an air temperature/relative humidity sensor, a wind speed/direction sensor, a non-intrusive road surface condition sensor, a non-intrusive road surface temperature sensor, all mounting/attachment hardware, cables, test equipment, manufacturer site commissioning, and server configuration necessary for a full and complete installation.

(a) *Remote Processing Unit (RPU)*

The RPU shall gather, process, and store data from all connected sensors; and allow for remote data collection, via NTCIP ESS protocol, by CDOT's centralized weather management servers. The RPU shall utilize a modular design consisting of a main data processing unit and secondary communication units that are used to power and connect sensors at the EFS site. The main data processing unit shall utilize a Reduced Instruction Set Computing (RISC) type processor and run a Linux based operating system capable of multi-tasking operations to optimize data acquisition from all connected devices. The RPU shall include in-built GPS for real-time clock synchronization and location definition.

The RPU shall support standardized communication protocols for sensors from various manufactures.

The RPU shall include a minimum of two (2) 10/100 Ethernet ports and six (6) serial ports configurable for RS-232, RS-485 2 wire, or RS-485 isolated 4 wire; capable of operating at full or

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REVISION OF SECTION 614
ENVIRONMENTAL FRICTION SYSTEM

half duplex from 300 to 115,200bps. All circuitry of the RPU, voltage inputs, sensor inputs, and communications ports shall be designed and tested to provide replaceable transient voltage and surge protection. The RPU shall include lightning protection for all communication channels and auto-reset circuit breakers for power.

The RPU shall utilize solid-state electronic components that operate consistently within a minimum temperature range of -40°F to 140°F and 0-90% RH non-condensing.

The RPU shall operate within a range of 90-260 VAC at 55-65 Hz and use no more than 60 watts of continuous power. The RPU shall have the capability of being modified to utilize solar power or other power sources in place of conventional commercial electric power. Solar powered RPU sites shall operate a minimum of 72 hours without sunlight or solar charging of the batteries. A solar powered RPU shall operate within a power range of 12-32 VDC.

The RPU shall support full site configuration and management via a web-based user interface for on-site and remote access. The RPU shall be capable of local and remote communications via serial RS-232, RS-485 2 wire and RS-485 isolated 4 wire utilizing PPP or PMPP protocols or 10/100 Ethernet connection utilizing TCP/IP protocol. The RPU hardware and software provided shall be compliant with the most current Federal standard National Transportation Communications for ITS (NTCIP) Environmental Sensor Station (ESS) communication protocols.

At minimum the RPU shall be capable of collecting data from the following:

- 1 wired air temperature/relative humidity sensor
- 1 wired wind speed/direction sensor
- 2 non-intrusive pavement condition sensor
- 2 non-intrusive pavement temperature sensor

The RPU shall include an IP66 rated lockable stainless steel AISI 316 powder coated enclosure that is resistant to weather, sunshine, de-icing chemicals, corrosion and damage from falling debris (ice, small rocks and tree branches) and vandalism. The enclosure shall be capable of being mounted on poles with an outer diameter range of 6 inches to 24 inches or EFS fold-over tower and have rubber flanges located at the bottom which provides cabling access. The enclosure shall house all RPU electronics, power supplies, and communication equipment and not exceed dimensions of 24 inches height by 20 inches width by 8.25 inches depth.

(b) *Air Temperature/Relative Humidity Sensor*

The air temperature/relative humidity sensor shall accurately measure outside ambient air temperature and relative humidity. The sensor shall have an air temperature sensing element that measures temperatures in a minimum range of -40°F to 140°F with an accuracy within 1 degree of actual temperature. The sensor shall have a relative humidity sensing element that measures a range of 0 to 100% RH with an accuracy within 1% of actual humidity levels. System dew point temperature shall be calculated from the air temperature and relative humidity. The sensor shall be protected by UV stabilized white thermoplastic solar/wind-radiation shield and meet IP66 rating.

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ENVIRONMENTAL FRICTION SYSTEM

The sensor shall operate within a power range of 7–30 VDC and use no more than 5 watts of power. The sensor shall include RS-485 2 wire serial data communication, 0 to 10 voltage, and resistance level outputs; and be capable of operating to specifications on cable lengths up to 100ft from the RPU.

Communication and power cable connecting the combined sensor to the RPU shall be shielded, with UV stable jacket rated for outdoor use. The Contractor is responsible for providing the correct length cable based on the planned installation.

The sensor shall include all mounting hardware necessary to complete the installation.

(c) *Wind Speed/Direction Sensor*

The wind speed/direction sensor shall accurately measure wind speed and direction without any moving parts. The sensor shall have an operating range of 0 to 145 mph, with a survival operation limit of 190 mph. Accuracy for measured wind speed shall be less than 3% of actual wind speed. Wind speed direction operating azimuth shall be measurable from 0 to 360°, with an accuracy of +/- 2°, and resolution of 1°. The sensor shall operate within a minimum temperature range of -40°F to 140°F. The sensor shall meet IP66 and IP67 ratings and include provisions to deter animal perching or nesting.

The sensor shall operate within a power range of 9-40 VDC and use no more than 30 watts of power. The sensor shall include both 0 to 5000 mV analog and RS-232/RS-485 digital outputs; and be capable of operating to specifications on cable lengths up to 100ft from the RPU.

Communication and power cable connecting the sensor to the RPU shall be shielded, with UV stable jacket rated for outdoor use. The Contractor is responsible for providing the correct length cable based on the planned installation.

The sensor shall include all mounting hardware necessary to complete the installation.

(d) *Non-Intrusive Pavement Condition Sensor*

The non-intrusive pavement condition sensor shall utilize Class 1 Laser technology to accurately differentiate and measure the presence of water, ice, slush, snow, or frost on the road surface. The sensor shall also measure the level of grip or friction coefficient of the roadway. The sensor shall be capable of accurate measurements within a minimum range of 7-50 feet. The sensor shall operate in a minimal temperature range of -40°F to 140°F at 0 to 100% RH.

The sensor shall operate within a power range of 9-30 VDC and use no more than 4 watts of power. The sensor shall provide RS-232 and RS-485 serial data communication interfaces; and be capable of operating to specifications a cable lengths up to 300ft from the RPU.

If the EFS is greater than 25ft from the white edge line of the roadway being measured, then the non-intrusive pavement condition sensor shall include a breakaway pole and underground conduit to install the sensor at an appropriate height to detect conditions in the closest lane of travel.

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Communication and power cable connecting the sensor to the RPU shall be shielded, with UV stable jacket rated for outdoor use. The Contractor is responsible for providing the correct length cable based on the planned installation.

The sensor shall include all mounting hardware necessary to complete the installation.

The quantity of non-intrusive pavement condition sensors and desired detection location shall be provided on the Plans or by the Project Engineer.

(e) *Non-Intrusive Pavement Temperature Sensor*

The non-intrusive pavement temperature sensor shall use infrared technology to accurately measure road surface temperature. The sensor shall be capable of accurate measurements at distances of 7-50ft from the roadway. The sensor shall operate in a minimal temperature range of -40°F to 140°F at 0 to 100% RH.

The sensor shall operate within a power range of 9-30 VDC and use no more than 0.05 watts of power. The sensor shall provide RS-232 and RS-485 serial data communication interfaces; and be capable of operating to specifications a cable lengths up to 300ft from the RPU.

If the EFS is greater than 25ft from the white edge line of the roadway being measured, then the non-intrusive pavement temperature sensor shall include a breakaway pole and underground conduit to install the sensor at an appropriate height to detect road temperature in the closest lane of travel.

Communication and power cable connecting the sensor to the RPU shall be shielded, with UV stable jacket rated for outdoor use. The Contractor is responsible for providing the correct length cable based on the planned installation.

The sensor shall include all mounting hardware necessary to complete the installation.

The quantity of non-intrusive temperature sensors and desired detection locations shall be provided on the Plans or by the Project Engineer.

CONSTRUCTION REQUIREMENTS

The Contractor shall install the EFS in accordance with the EFS vendor's recommendations, CDOT Plans and Standard Specifications and all federal, state and local codes and requirements. The Contractor will be responsible for providing all traffic control/safety work zones for the installation of the roadway sensors in accordance with the CDOT traffic control requirements.

Allowable mounting structures for the Environmental Friction Sensor Station RPU and sensors include:

- WMS fold-over tower
- Dynamic message sign (DMS)
- Light standard metal pole
- Fiberglass pole
- Lowering device pole

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REVISION OF SECTION 614
ENVIRONMENTAL FRICTION SYSTEM

Dependent on location and type of mounting structure additional mounting materials for sensors may be required to achieve accurate measurements. Contractor shall install all Environmental Friction Sensor System RPU and sensors per vendor's recommendations.

For new installations the Contractor shall install a 120 VAC electrical supply from the power source shown on the plans to a location near the RPU. The primary power should be connected to the RPU with resettable overcurrent protection rated for 20 amps, with voltage surge protection. Replacement and installation of RPU and sensors at existing locations shall be powered via uninterrupted power supply (UPS) when available.

The air temperature/relative humidity sensor shall be mounted on the EFS tower per manufacturer's recommendations at the standard meteorological height of approximately 6ft above ground level in a UV stabilized white thermoplastic solar/wind-radiation shield.

The wind sensor shall be mounted on top the EFS tower per manufacturer's recommendations at the standard meteorological height of approximately 30ft above ground level. The sensor shall be mounted such that birds are not able to perch or nest on the sensor. The sensor shall be configured & calibrated to function as designed with the RPU.

The non-intrusive pavement condition sensor shall be mounted on the EFS tower per manufacturer's recommendations at a height and angle that will allow measurement of the middle of the closest lane of travel.

The non-intrusive pavement temperature sensor shall be mounted on the EFS tower per manufacturer's recommendations at a height and angle that will allow measurement of the middle of the closest lane of travel.

If the EFS is greater than 25ft from the white edge line of the roadway being measured then the non-intrusive conditions and temperature sensors shall be mounted on a breakaway pole installed 15ft from the same white edge line. Conduit and pull boxes shall be installed between the EFS and pole to connect the sensor to the EFS RPU.

The Contractor is responsible for using the appropriate communication protocol based on RPU to sensor connection to maximize communications reliability.

All sensor cables connecting to the RPU shall be secured to themselves and the structure every three ft. Cables shall enter through the bottom of the RPU enclosure, be labeled by sensor type, and connect to the appropriate port on the RPU.

Any sensors installed on lowering device poles shall be mounted such that they don't interfere with the operation of the lowering system or device being lowered.

The Contractor is responsible for connecting the EFS to communication infrastructure provided by the project.

After completion of the equipment installation, the equipment manufacturer representative shall perform all final system checks, sensor alignments/calibration, sensor setup, RPU configuration including site communication setup, and central server configuration to provide a fully operational EFS. If Contractor

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ENVIRONMENTAL FRICTION SYSTEM

requests remote configuration via VPN, contractor shall complete and submit CDOT access form four weeks in advance for approval.

All associated hardware required for a complete installation is considered subsidiary and is and shall be included as part of the work.

REVISION OF SECTION 614
TRAFFIC MANAGEMENT SYSTEM BUILDING

Section 614 of the Standard Specifications is hereby revised to include the following:

DESCRIPTION

The work shall include the engineering, structural design, off-site fabrication, delivery, and installation of a Traffic Management System Building. The Traffic Management System Building will house equipment that serves as the concentration point for field communications prior to integration with a communications backbone and shall house the communications backbone equipment, power distribution, standby power and miscellaneous equipment as specified in these specifications and as directed in the Plans.

The manufacture shall construct and deliver a Traffic Management System Building and associated equipment as shown on the Plans and as directed within these specifications. The term "associated equipment" shall be interpreted to include all components systems, and apparatus housed in, connected to, integral to the Traffic Management System Building.

The Traffic Management System Building location shall include an asphalt driveway to building and asphalt parking area to accommodate two vehicles. A chain link fence with a double gate shall also be provided at this location. At a minimum, the fence shall enclose the building, external grounding system, generator, and parking area.

Working drawings shall show Traffic Management System Building design, foundation design, electrical design, and any other associated equipment as shown on the plans and as directed within these specifications shall be sealed by an Engineer registered in the State of Colorado and shall be submitted in accordance with subsection 105.02 for approval

MATERIALS

The Traffic Management System Building shall be a precast concrete facility installed at the site as indicated on the Plans.

The Traffic Management System Building shall be certified in the State of Colorado and conform to the to the State's currently approved building codes including, but not limited to, the following standards: International Building Code (IBC), International Mechanical Code, Uniform Plumbing Code, International Plumbing Code, American with Disabilities Act (ADA) Accessibility Guidelines for Shelters and Facilities, International Fire Code, National Fire Protection Association (NFPA) guidelines, and the National Electric Code, and International Energy Conservation Code. For localized information on structural load requirements (e.g., live loads, snow loads, wind loads, etc.), the Traffic Management System Building shall conform to either the Structural Design section of the local agency building code, the State of Colorado adopted building code requirements, or structural load requirements stated herein, whichever is more stringent.. The structural design and details shall be stamped by a Colorado Professional Engineer.

The Traffic Management System Building shall nominally measure at least 28 feet by 14 feet unless otherwise required due to architecture circulation requirements, electrical equipment floor space, and working clearances and as Approved in writing by the Department. Future floor space shall be provided adjacent to the Traffic Management System Building UPS for the future addition of a second UPS in a 1+1 configuration.

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TRAFFIC MANAGEMENT SYSTEM BUILDING

The Traffic Management System Building shall include:

(1) Interior and exterior lights as indicated and scheduled on the plans
(2) 20-Amp/120 volt alternating current duplex outlets as indicated on the plans
(3) Special purpose 120 volt and 240 volt electrical outlets installed in cast boxes under the raised access floor as indicated on the plans
(4) Power distribution to all installed electronic equipment, air conditioning and other associated equipment installed
(5) Lightning protection for the overall integrated structure
(6) Internal "Halo" grounding system including but not limited to bonding to the rack-mounted equipment, equipment racks/cabinets, raised access floor pedestals, overhead or underfloor cable pathways, and electrical equipment enclosures
(7) A single point grounding system for the shelter and associated equipment.
(8) Two air conditioning units under lead lag control

(9) Rain hoods and filters, where applicable, for all ventilation fans, motorized louvers, air conditioner / heaters, doors, etc.
(10) Vandal protection cages for the air conditioner / heaters and external lighting
(11) Smoke alarms, over and under temperature alarms, door alarms, loss of power alarm, air conditioner / heater failure alarm
(12) A standby power generator
(13) A raised access floor system in the equipment room, color to be Approved by the Engineer
(14) Interior wall paneling colors and style to be Approved by the Engineer
(15) Exterior shall be stone aggregate, color and style to be Approved by the Engineer
(16) A double wide door for entry into the equipment room
(17) A single door for entry into the equipment room

All equipment and materials furnished for this Traffic Management System shall be new and of prime quality and shall not have been used previously.

The asphalt driveway and parking area shall conform to the requirements of Section 400 of the CDOT Standard Specifications for Hot-Mix Asphalt (HMA) pavement construction. The parking area shall accommodate two vehicles that each have the following dimensions: 20 feet in length and 7 feet in width. The site grading and driveway slope shall be designed and constructed such that surface water flows away from the building, generator, and parking area. A 6 feet high chain link fence with 24 feet wide double gate shall be provided to enclose the building, external grounding system, generator, and parking area. The chain link fence shall conform to the requirements of CDOT Standard Plan No. M-607-2 and include grounding, if required per code.

The Plans provide a suggested associated equipment layout and installation plan based on generic equipment and not necessarily the equipment selected by the Manufacture. To this extent, the Manufacture shall be responsible for providing:

(1) Manufacturer's cut sheets, published specifications, shop drawings, material descriptions, and structural drawings of the Traffic Management System Building and its associated equipment shall be provided to the Engineer for review and approval.
    a. Shop drawings shall include fabrication drawings and attachment of the various components,

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TRAFFIC MANAGEMENT SYSTEM BUILDING

including reinforcement detailing, bending, and placing concrete reinforcement in compliance with ACI 318 and Concrete Reinforcing Steel Institute (CRSI) Manual of Standard Practice, as applicable.

b. Elevations, sections, and dimensions for all precast concrete units including anchors, inserts, and embedded cast-in place items.

c. Mechanical, electrical, and plumbing layouts indicating location of all respective equipment, and routing of conduits and plumbing lines.

(2) Structural drawings, section details, and calculations provided shall be stamped by a Colorado Professional Engineer.

(3) Geotechnical Soils Report provided shall be stamped by a Colorado Professional Engineer.

(4) Foundation drawings and generator slab drawings and calculations provided shall be stamped by a Colorado Professional Engineer.

(5) Approvals and certificates as required by the State and/or code compliance.

Manufacturer shall perform work in compliance with applicable quality assurance requirements of ACI 318, Precast/Prestressed Concrete Institute (PCI) MNL-116, PCI MNL-120, PCI MNL-123, PCI MNL-124, and PCI MNL-127, as applicable.

The Manufacture shall provide commercial manuals on:

(1) Automatic transfer switch
(2) Transient voltage surge suppressor
(3) Alarm system
(4) Main service entrance disconnect
(5) Electrical panel boards
(6) Rack-mounted power distribution modules
(7) All other supplies associated with equipment, where applicable

Documentation is considered to be part of the Traffic Management System Building delivery.

Each item of equipment and all of its auxiliary equipment shall be warranted by the Manufacture against all defects in material and workmanship for a period of 1 year. The Traffic Management System Building itself and the generator shall be warranted for five years for materials, workmanship, and structural integrity.

(a) *Human Safety.*

All Traffic Management System Building equipment shall comply with all commercial safety standards for electronic equipment and shall not contain any sharp edges. Power input requirements (i.e., voltage and current) shall be marked clearly on all Traffic Management System Building equipment. All power interconnections shall be protected against inadvertent contact by maintenance personnel. No cabinet shall include any exposed voltage above 24 volts or exposed current above 100 miliampere. Protective covers shall be provided where required to prevent inadvertent power terminal contact by equipment technicians. Safety markings shall be included for any protective covers over high voltage, high current or both.

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(b) *System Safety.*

Shorting or opening an interface shall not cause permanent damage to an interface circuit. Lightning protection for all copper signal circuits shall be provided. All connectors and cables shall be clearly marked. Similarly, all indicators and controls shall be clearly and accurately marked as to function. All power interconnections shall be protected against inadvertent contact by maintenance personnel.

(c) *Lightning Protection.*

The manufacture shall furnish and install a lightning protection system for the Traffic Management System Building. The manufacturer shall provide the required number of 10 inch air terminals based on a 20 foot spacing as defined in NFPA-780. Firmly anchor all air terminals; course the conductors properly; run them straight between devices and make proper bends where required; use the proper attachment for Traffic Management System Building surface; utilizing aluminum components for mounting to aluminum flashing, and copper conductors and components for mounting on steel building components. Utilize copper for all conductors and components that may come in contact with the ground. Utilize bi-metallic connectors when connecting dissimilar metals. Mechanical connections may be utilized for exposed connections. Firmly attach conductors to the Traffic Management System Building (node building).Make all joints and connections in accordance with connector manufacturer's recommendations. The course of all conductors shall be horizontal or downward, never upward. The completed system shall comply with the latest editions of the Underwriters Laboratories (UL) "Installation Requirements for Lightning Protection Systems, UL96A" and National Fire Protection Association's "Lightning Protection Code," NFPA 780. Adequate wire length shall be provided from this system to attach to the ground once the Traffic Management System Building is in place.

(d) *Traffic Management System Building Ground.*

The manufacture shall furnish and install a power grounding system in accordance with the Plans. Grounding electrodes and grounding electrode conductors shall be provided and installed (i.e., bonded) per the NEC. All noncurrent carrying metal parts of electrical or electronic equipment shall be separated by at least 6 feet from those of the lightning protection system, per Article 810.18 of the NEC. The Traffic Management System Building shall include an interior halo ground ring that is interconnected with the building grounding electrode system. The halo ring shall facilitate a common bonding point for all Traffic Management System Building equipment ground conductors and other loose metals. The halo ring conductors shall be copper, installed on insulated standoffs. All halo cable connections shall be made with irreversible compression fittings. Connections to equipment enclosures shall be made with two-hole compression lug connectors. The building grounding plates shall be connected directly to the buried ring and utilized for system grounding as indicated on the Plans. Adequate wire length shall be provided from this system to attach to the ground once the Traffic Management System Building is in place.

(e) *Air Conditioner /Heater.*

HVAC design considerations shall be as required for the successful deployment of IT and telecommunications-related equipment in the Traffic Management System Building. Guidelines for

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TRAFFIC MANAGEMENT SYSTEM BUILDING

optimal temperature and humidity set points in the Traffic Management System Building shall be as recommended by the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) TC9.9, unless otherwise specified by the Engineer. The air conditioner / heater system, its appurtenances, and its installation shall comply with the requirements of the NEC, the NFPA, and the air conditioner / heater manufacture recommendations. A rain shield for the air conditioner / heaters shall be provided on the Traffic Management System Building exterior. The manufacture shall furnish and install steel bar or wire cage security for air conditioner / heaters to prevent theft, vandalism, and entry to the facility. The steel bar or wire cage shall not interfere with the air conditioner / heater's normal operation and performance.

Routine preventive maintenance (i.e., filter change), system control configuration, and electrical disconnect shall be feasible and convenient means of access to the system without complete disassembly of the steel-bar security. It shall not be possible to detach the air conditioner / heater security bars from the Traffic Management System Building exterior. Refer to the Revision of Section 614 – HVAC special provision for additional requirements.

(f) *Wire and Cable.*

All wiring shall be installed in accordance with NEC. All conductor sizes shall be in accordance with NEC and shall be copper. Where wire and cable routing is not shown, and destination only is indicated, the manufacture shall propose a routing and length required. All wire shall be new.

Insulation shall have a 600-volt rating. In light fixtures and other high temperature applications, the insulation shall be rated 90 °C.

Other areas shall use insulation rated 75 °C unless stated otherwise in other parts of these specifications and Plans. All conductors shall be suitable for the application intended. Conductors No. 10 American Wire Gauge (AWG) and larger shall be stranded. Conductors No. 12 AWG and smaller shall be solid.

Use type THW, THHN, or THWN insulation for feeders and branch circuits. Provide protection for exposed cables where subject to damage. Wiring inside junction boxes, equipment, and panel boards shall be performed in an organized, neat, and workmanlike manner. All wire and cable shall be installed in conduit (with obvious exceptions such as the interior cabinet wiring, etc.). Do not use wire smaller than No.12 AWG for outlet power and lighting circuits.

Splices only allowed in junction boxes. Use plastic ties to support cable as needed. All splices shall have an electrical resistance not in excess of a 60 ft. run of the conductor. Use solderless spring type pressure connectors with insulating covers for wire splices and taps, 10 AWG and smaller. Use mechanical or compression connectors for wire splices and taps, 8 A WG and larger. Thoroughly clean wire before installing lugs and connectors. At all splices and terminations, leave tails long enough to cut splices out and completely re-splice.

(g) *Conduit.*

All conduit runs and sizing shall be in compliance with the NEC unless larger conduit sizes are indicated on the drawings. Verify location and pathway of conduit runs before installation. Conduit shall be in run in either flexible or rigid conduit under the false floor to junction boxes and then

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routed to equipment. All conduits and boxes shall be securely fastened to the Traffic Management System Building structure.

Galvanized rigid conduit shall be used for the conduit run from the fiber optic manhole into the Traffic Management System Building.

Conduit shall conform to the following material requirements.

1. Rigid Metal Conduit and Fittings:
   A. Rigid Steel Conduit: ANSI C80.1; hot-dip galvanized.
   B. PVC Externally Coated Conduit: NEMA RN 1; rigid steel conduit with external PVC coating and internal galvanized surface.
   C. Fittings and Conduit Bodies: NEMA FB 1; threaded type, material to match conduit.
2. Electrical Metallic Tubing (EMT) and Fittings:
   A. EMT: ANSI C80.3; hot-dipped galvanized tubing.
   B. Fittings and Conduit Bodies: NEMA FB 1; steel compression type.
3. Flexible Metal Conduit and Fittings:
   A. Conduit: Galvanized steel strips, spirally wound.
   B. Fittings and Conduit Bodies: NEMA FB 1.
4. Liquidtight Flexible Conduit and Fittings:
   A. Conduit: Flexible metal conduit with PVC jacket and integral grounding conductor.
   B. Fittings and Conduit Bodies: NEMA FB 1; liquidtight, zinc coated steel.
5. Nonmetallic Conduit and Fittings:
   A. Conduit: NEMA TC 2; Schedule 40 PVC.
   B. Fittings and Conduit Bodies: NEMA TC 3.

(h) *Foundation Requirements.*

The manufacture shall provide a professional engineered signed and stamped Traffic Management System Building foundation plan, generator pad, and calculations adequate for the Traffic Management System Building specified herein. The foundation shall be a steel reinforced concrete structural grade-beam supported by caissons. The generator pad shall be a steel reinforced concrete thickened edge slab. The manufacture shall have the foundation professional engineer perform a site soil survey as necessary for the proper foundation design and generator slab design for the site conditions. All concrete used in the grade beams shall have a minimum 4500 psi field compressive strength at 28 days, a minimum cement content of 615-660 lbs/cy, an air content of 5-8 percent, and a maximum water to cement ratio of 0.45. All concrete used in the caissons shall have a 4000 psi field compressive strength at 28 days, a minimum cement content of 610 lbs/cy, no minimum air content, and a maximum water to cement ratio of 0.45.

All reinforcing bars shall be ASTM A615, Grade 60. All concrete used in the generator slab shall have a minimum 4500 psi field compressive strength at 28 days, no minimum cement content, an air content of 5-8 percent, and a maximum water to cement ratio of 0.45. The configuration of the grade beam shall not restrict the installation or configuration of the entrance ramp to the shelter. The foundation and generator pad plan to be provided by the building manufacture shall be delivered to CDOT for approval.

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(i) *Traffic Management System Building – General.*

The Traffic Management System Building shall be dust-tight and watertight. The Traffic Management System Building shall also be secured from vermin. The Traffic Management System Building shall meet the structural specifications as set forth unless otherwise Approved by the Engineer.

1. Concrete
All concrete shall conform to the requirements of the soils report. Any requirements in this specification that conflict with the soils report shall be superseded by the requirements in the soils report. Portland cement shall conform to ASTM C150 Type V. Sand shall conform to ASTM C33. Lightweight fine and coarse aggregates shall conform to ASTM C330. Air entraining admixtures shall conform to ASTM C260.All concrete work shall conform to ACI 318 building code requirements for reinforced concrete and shall have minimum 28-day compressive test strength of 4000 psi, coarse aggregate shall be ¾ inch nominal size. Water shall be clean and potable. Cement aggregate shall be stored in a way that keeps them free from foreign substances that would affect their compatibility with the mixture and keep them from deteriorating.

Concrete shall have a density of 143 lbs/cf when cured. Concrete shall be cured in forms and protected from moisture loss, freezing and excessive heat until compressive strength reaches the required minimums. Any minor cracks and/or chips that do not affect the structural integrity of the panel or component shall be patched in accordance with ASTM C858. Severe cracks, spalling, etc. as evident once the Traffic Management System Building has been delivered shall be evaluated by the Traffic Management System Building manufacturer and the Engineer before repairs are attempted. CDOT may repair these areas and the cost of the repairs will be deducted from monies due to the Contractor. If the structural integrity is impaired, the building will be not accepted.

2. Reinforcing Steel
All reinforcing steel shall be sufficiently secured to withstand any displacement during the pouring operation. All bars shall be of intermediate grade, or hardcore billet steel conforming to ASTM A615 and or A706. All welded wire mesh shall be steel wire fabric conforming to the requirements of ASTM A 185.

3. Roof
The Traffic Management System Building shall have a 4 inch thick (minimum) reinforced concrete, gable panel roof. The roof is to have a 2 inch perimeter drip lip. Minimum pitch shall be 6.25 percent. Roof reinforcement shall consist of No.4 rebar and or welded wire-mesh. The rooftop surface and all joints and seems shall be water proof.

4. Walls
Walls shall be 4 inch thick (per ACI 318), flat reinforced concrete panels Wall reinforcement shall consist of No. 4 rebar, welded wire mesh or both. The Traffic Management System Building walls shall have a two-hour fire rating as described in the IBC. Interior walls shall be steel studs with R-14 minimum Polyisocyanurate insulation covered with ¾ inch thick plywood. The walls and ceiling shall be painted semi-gloss white. Floor to wall intersection

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shall be finished with 4 inch vinyl baseboard.

5. Floor
The floor shall be reinforced concrete, with 8 inch deep ribs and 2 inch thick flange. Ribs shall be spaced at 2 feet on center across the width of the Traffic Management System Building and 4 feet along the length (minimum). The floor shall contain provisions for lifting the Traffic Management System Building and securing it to the foundation. Floor reinforcement shall consist of No. 6 rebar, No.4 rebar, welded wire mesh or both.

6. Panel Connections
Panel to panel connections shall be welded using steel plates cast into the floor, roof and walls. Steel plates shall conform to ASTM A36. Welding shall conform to American Welding Society (AWS) D1.1 and AWS 01.4. Panel construction shall conform to ACI 318. All joints and seems shall be water proof.

7. Structural Loading
Structural loading shall be based on localized information on structural load requirements (e.g., live loads, snow loads, wind loads, etc.) and shall conform to either the Structural Design section of the local building code or the ensuing requirements, whichever is more stringent. The Traffic Management System Building floor shall be designed to support 15 lbs/sq ft dead load weight along with any live and dead loads imposed by the suspended floor when supported on a perimeter grade beam foundation. The roof shall be designed to support 10 lbs/sq ft dead load and 30 lbs/sf live load. The Traffic Management System Building shall be designed to withstand winds of 150 miles per hour, exposure D. Traffic Management System Building shall be designed to exceed seismic zone 4 requirements.

8. Weather Resistance
The Traffic Management System Building shall completely weatherproof. Each structural Panel shall be impregnated with a chemical moisture barrier to prevent seepage. All panel joints (wall to ceiling, wall to wall and wall to floor) shall be sealed with a permanent no-caulk weather seal (closed cell expanded neoprene). The wall to floor joint shall utilize a step joint, while all other joints shall have a groove/step joint all sealed with pre-compressed sealant tape. The doorways shall include a step-joint threshold and a drip overhang over the top of the doorframe.

9. Exterior Finish
The exposed reveals shall be-painted with sand textured concrete paint. The color shall be Home Depot, Color Bronze, Paint Code 151514229769 or an Approved equal color match. Samples of the painted exterior finish shall be submitted to and Approved by the Engineer.

10. Traffic Management System Building Dimensions
The outside dimensions of the Traffic Management System Building shall be at least 12 feet in width and 28 feet in length. The interior ceiling height shall be at least 8.5 feet in height after installation of the false floor.

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11. Raised Access Floor System
A raised access floor system shall be designed, engineered, fabricated and installed within the Traffic Management System Building equipment room to comply with performance requirements per test methods and references specified or, if not specified, per the manufacturers standard methods. The raised access floor system shall have a minimum height of 8 inch as measured from the Traffic Management System Building floor. The system shall not alter the A.D.A compliant entry guidelines into the Traffic Management System Building nor that for mobility issues. The completed floor system shall be rigid, free of vibration, free of rocking panels and shall provide a smooth uniform floor surface. The overall floor shall be level within plus or minus 0.5 inch in 10 feet non-cumulative. The access floor system shall consist of the following components:

Steel panels meeting the following requirements:

A. The panels shall be modular, removable and shall measure 24 inch by 24 inch.
B. The panels shall consist of a top steel sheet welded to a formed steel bottom pan.
C. The panels shall be easily removable by one person with a lifting device, which shall be provided by the Manufacture, and shall be interchangeable except where cut for special conditions.
D. Each panel shall support a concentrated load of 1000 lbs per square inch placed on an area at any location on the panel, with a maximum beam deflection of 1/8 inch.
E. Each panel shall support a uniform load of 250 lbs per square inch placed on an area at any location on the panel with a maximum beam deflection of 1/16 inch.
F. Each panel shall withstand a load of 2400 lbs per square inch placed on an area, at any location on the panel, without failure.
G. Covering material for the panels to provide a low static, easily maintainable floor, that is slip resistant when wet. The covering shall be a minimum of 1/8 inch thick pressure laminate in color Approved by the Engineer. The covering shall be a surface sheet over a melamine-impregnated sheet with the core material being phenolic-impregnated kraft papers. The covering shall be bonded to the steel panel with a moisture resistant adhesive in accordance with the adhesive manufacturer's recommendations.

Adjustable height pedestal assemblies to support the steel panels shall meet the following requirements:

(1) Pedestal assemblies shall be corrosion-resistant, aluminum or steel construction, and shall provide an adjustment range of +/- 1 inch.
(2) Pedestal assemblies shall provide a means of leveling and locking the assembly at a selected height, which requires deliberate action to change height setting and prevents vibration displacement.
(3) Threaded rods shall provide a specially designed anti-rotation device, such that when the head assembly is engaged in the base assembly, the head cannot freely rotate.
(4) The pedestal assembly shall provide an 8000 lbs axial load without permanent deformation.
(5) Pedestal assembly shall provide an average overturning moment of 8 lb-feet when glued to a clean, uncoated concrete surface. The pedestals shall adhere to

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the concrete floor with a sealer recommended by the manufacturer.

12. Traffic Management System Building Lighting
The interior lighting requirements of the Traffic Management System Building shall conform to the current version of Telecommunications Industry Association (TIA)-942. The illuminance requirements in the horizontal and vertical planes shall be articulated in the Plans and designed based on measurements three feet above the raised finished floor on the front and rear aisles of the racks/cabinets.

The interior Traffic Management System Building lighting shall be ceiling-mounted general-purpose fluorescent tube fixtures. Each light shall be equipped with 48-inch, T-8 LED tubes and full width reflectors. The ballast, if required, shall be electronic 120V, 60 Hz complying with Federal Energy Efficiency Standards. Interior lighting shall be controlled by two different wall-mounted 3-way switches located for easy access at each entrance. Exact location of the ceiling mounted fixtures shall be determined by the Manufacture based on his/her final equipment installation. Aside from illuminance requirements, fixture placement should also be based on accessibility for maintenance operations. Two (2) vandal-resistant and weatherproof exterior lighting fixtures shall be provided as indicated on the plans. Each fixture shall utilize an LED bulb (equivalent to a 60 W incandescent bulb) and be powered by120VAC, 60 Hz, The exterior lighting shall be activated by motion within 10 feet or less of the door with activation for a minimum of 10 minutes by motion within 10 feet or less of the building with activation only during dusk to dawn.

13. Equipment Room Exterior Door
The door shall be constructed of 18 gauge galvanized steel, full flush, windowless, and painted to match exterior and interior. One door shall be doublewide with minimum dimensions of 7 feet in height and 6 feet in width. The other door shall be a minimum dimension of 7 feet in height and 3 feet in width. The hinges and other exterior hardware shall be stainless steel or other acceptable corrosion proof material. The hinges shall use flush-type, non-rising pins with concealed setscrews for security against vandalism. The doors shall include a neoprene gasket which, when closed, effectively prevents the entrance of air, blowing sand, dust, and water. A weather strip shall be provided at the bottom of the door. The doors lock shall be of a non-corrosive material and shall utilize the Velocity access control system from Identiv (formerly Hirsch) for compatibility with other CDOT facilities. Proposed access control system equipment, firmware, and software at the Traffic Management System Building must be compatible with the current version of Velocity and card credentialing being utilized by CDOT; and obtained and installed by a vendor authorized and certified by Identiv. The doors shall contain an alarm (magnetic sensor) to detect opening; this alarm shall be integrated with the Traffic Management System Building alarm terminal strip. The doors shall contain an astragal. The doors shall have a four-sided frame and shall be level with the raised floor system.

14. Electrical
The manufacture shall provide all electrical wiring, meter enclosure, power distribution panels, grounding, power protection, and lightning protection as required. Install, operate, and test the equipment from the power utility meter location to the power inputs of all associated equipment and electrical/electronic apparatus prior to shipment. All power cabling shall comply with the NEC. Grounding commonality with commercial utility power shall be

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provided. Grounding shall comply with the NEC and IEEE 1100, "Recommended Practice for Powering and Grounding Sensitive Electronic Equipment" as referenced for a single-point grounding system and as specified and indicated in the Plans.

The manufacture shall provide a steel 6 inch x 6 inch raceway the length of the Traffic Management System Building (28 feet) under the raised access floor at the middle point of the shelter for the purposes of future routing of equipment wiring.

There shall be two lateral raceway connections directed towards the conditioned power panel location and the floor access hole.

15. Service and Distribution
For information only, the power service provided to this Traffic Management System Building shall be 120/208 VAC 250 amp (80% rated), three phase, 60 Hz, four wire and ground. The building manufacture is required to uninstall the temporary meter and connect the service line to the permanent service disconnect switch / meter housing provided on the exterior of the building. The telephone service shall be a 1 megabyte line. If required, CDOT will install a temporary demark through a separate Project. The building manufacture is required to uninstall this temporary demark and install the service line to the permanent demark provided on the exterior of the building.

16. Automatic Transfer Switch
The Automatic Transfer Switch (ATS) shall transfer the load from the utility to the generator. The ATS shall be an open transition double throw switch furnished and installed at locations as shown on the Plans or as Approved by the Engineer. Switches shall be of the type Approved, indicated and specified herein. The ATS shall have a NEMA Type 1 rating and meet UL 98. Lugs shall be front removable and UL Listed for aluminum or copper. All current carrying parts shall be plated to resist corrosion. Switch operating mechanism shall be 3-pole and rated at 300 ampere. Provisions shall be made for padlocking the switch in the OFF position. Switch covers shall be attached with welded pin-type hinges. The switch enclosure shall be finished with gray baked enamel paint that is electrodeposited on cleaned, phosphate pretreated steel (Type 1). The enclosure shall be supplied with a metal nameplate that includes NORM-OFF-EMER markings.

17. Service Disconnect Switch (SDS)
The SDS shall be furnished and installed at locations as shown on the drawings. The SDS shall be of the type Approved, indicated and specified herein. The SDS shall be manufactured in accordance with the following standards UL 98 – Safety Enclosed and Dead Front Switches. The SDS shall be fused and suitable as use for service equipment and labeled for this application. All switches shall have switchblades which are visible when the switch is OFF and the cover is open. Lugs shall be UL Listed for 90°C conductors, aluminum or copper. All current-carrying parts shall be plated to resist corrosion. The switch operating mechanism shall be quick-make, quick-break such that, during normal operation of the switch contacts shall not be capable of being restrained by the operating handle after the closing or opening action of the contacts has started. The operating handle shall be an integral part of the box and not the cover. Provisions shall be provided for padlocking the switch in the OFF position. The enclosure shall be finished with gray baked enamel paint which is

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electrodeposited on cleaned, phosphate pre-treated steel, NEMA Type-3R. The SDS shall be 3-pole heavy duty, rated for 250 VAC and 400 amps. The ampere square seconds (I2t) and peak let-through current (Ip) ratings shall be in accordance with UL-489. Provide with Class-R 250-amp 80% rated fuses.

18. Main Power Distribution Panel Board
The panel boards shall be located on an inside wall of the building. All breakers shall be sized to accommodate the Manufactures selected equipment and or based on equipment manufacturer recommendations.

A. Panelboard Interior

(1) The Main Power Distribution Panelboard shall be rated for 120/208 VAC, 250-amp 3-phase. Branch Circuit and UPS Distribution Panelboards shall be main circuit breaker type, rated for 120/208VAC, 200-amp, 3-phase; main circuit breaker size shall be as scheduled. The amperes interrupting current (AIC) rating of all Panelboards shall be as scheduled.
(2) Provide one continuous bus bar per phase. Each bus bar shall have sequentially phased branch circuit connectors suitable for bolt-on branch circuit breakers. The bussing shall be fully rated. Panel board bus current ratings shall be determined by heat-rise tests conducted in accordance with UL 67. The bus shall be copper.
(3) All current-carrying parts shall be insulated from ground and phase-to-phase by Noryl high dielectric strength thermoplastic or equivalent.
(4) Split solid neutral shall be plated and located in the main compartment so all incoming neutral cable is the same length.
(5) Interior trim shall be of dead-front construction to shield user from energized parts. Dead-front trim shall have pre-formed twist outs covering unused mounting space.
(6) Name plates shall contain system information and catalog number or factory order number. Interior wiring diagram, neutral wiring diagram, UL Listed label and short circuit current rating shall be displayed on the interior or in a booklet format; Interiors shall be field convertible for top or bottom incoming feed. Main and sub feed circuit breakers shall be vertically mounted.

B. Main Circuit Breaker
(1) The main circuit breaker shall have an over center, trip-free, toggle mechanism that shall provide quick-make, quick-break contact action. Circuit breakers shall have a permanent trip unit with thermal and magnetic trip elements in each pole.
(2) Each thermal element shall be true root mean square (rms) sensing and be factory calibrated to operate in a 40° C ambient environment. Thermal elements shall be ambient compensating above 40° C.
(3) Two and three-pole circuit breakers shall have common tripping of all poles.
(4) Breaker handle and faceplate shall indicate rated ampacity. Standard construction circuit breakers shall be UL listed for reverse connection without restrictive line or load markings.
(5) Lugs shall be UL listed to accept solid or stranded copper and aluminum conductors.

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(6) Lugs shall support conductors that have a temperature rating of 75° C sized according to NEC Table B310.15. Lug body shall be bolted in place; snap-in designs are not acceptable.

C. Branch Circuit Breakers
(1) Circuit breakers shall be UL listed.
(2) Molded case branch circuit breakers shall have bolt-on type bus connectors.
(3) Circuit breakers shall have an overcenter toggle mechanism that shall provide quick-make, quick-break contact action. Circuit breakers shall have thermal and magnetic trip elements in each pole. Two-pole circuit breakers shall have common tripping of all poles.
(4) There shall be two forms of visible trip indication: The breaker handle shall reside in a position between ON and OFF and there shall be a red indicator appearing in the clear window of the circuit breaker housing.
(5) The exposed faceplates of all branch circuit breakers shall be flush with one another.
(6) Lugs shall be UL listed to accept solid or stranded copper and aluminum conductors.
(7) Lugs shall support conductors that have a temperature rating of 90°C, sized according to NEC Table 310-16. Branch circuit breakers rated 30 amperes and below shall be UL Listed for 60°C rated wire.

D. Enclosures
(1) NEMA Type 1
(2) Enclosures shall be constructed in accordance with UL 50 requirements. Enclosures shall be painted with ANSI 49 gray enamel electrodeposited over cleaned phosphatized steel.
(3) All doors shall be equipped with a tumbler-type vault lock and two additional trunk-type latches. All lock assemblies shall be keyed alike. Two keys shall be provided with each lock. A clear plastic directory cardholder shall be mounted on the inside of door.
(4) Maximum enclosure dimensions shall not exceed 20 inch wide and 6.5 inch deep.

E. Installation

(1) Install panel boards in accordance with manufacturer's written instructions, NEMA PB, 1.1, and NEC standards.
(2) Anchor panel boards to structure and make branch circuit connections.
(3) Inspect complete installation for physical damage, proper alignment, anchorage, and rounding.
(4) Measure steady state load currents at each panel board feeder; rearrange circuits in the panel board to balance the phase loads within 20% of each other. Maintain proper phasing for multi-wire branch circuits,
(5) Check tightness of bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written specifications.

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19. Transient Voltage Surge Suppression (TVSS)
A TVSS designed for permanent connection and service entrance application' shall be installed at the Traffic Management System Building as a means of power protection from damaging transients and electrical line noise. By definition, the term TVSS describes the equipment necessary for the protection of all AC electrical circuits from the effects of lightning' induced voltages and utility substation switching. The installation shall allow for servicing of the unit without interrupting power to the loads. The TVSS shall be designed to operate in a 3-phase 120/208 VAC 4-wire, , 60Hz system with protection modes from line to neutral, line to ground, and neutral to ground. The unit shall have maximum surge current rating of 100kiloampere. The unit shall be mounted in a NEMA 1 enclosure and provide visual failure indication and communicate them via relay contacts to the Traffic Management System Building alarm system. The TVSS shall be based on metal oxide varistor (MOV) technology with MOV s in parallel and individually fused. The TVSS shall be UL 1449 listed, and tested and approved for IEEE C62.41.1. Categories A, B, and C. The TVSS shall be installed in accordance with the manufacturers printed instructions to maintain warranty. No testing shall be required.

20. Grounding and Bonding.
The grounding design for all Traffic Management System Building equipment shall accomplish at least the following:
A. Personnel and equipment protection from electrical hazards.
B. Prevent voltage potentials in the grounded power conductors of Node Building Shelter equipment.
C. Provide a single point grounding system for all associated equipment, enclosures, racks, drawers, assemblies, and subassemblies (i.e., chassis/rack) at each Traffic Management System Building site.
D. Prevent static charge accumulation that could promote electromagnetic interference or constitute a shock hazard to personnel.
E. Provide a fault current-to-ground path.

Safety considerations shall require the chassis or enclosures for electrical equipment to be grounded to minimize shock hazards to personnel. Proper grounding methods shall be implemented to minimize any noise voltage generated by currents from two or more circuits flowing through a common ground impedance and to avoid creating ground loops susceptible to magnetic fields and differences in ground potential. The manufacture shall implement grounding designs as specified in the specifications and on the Plans.

21. Grounding Configuration
The grounding system shall be composed of a buried ring, interior halo, ground connections, floor ground system, and rods as required. A horizontal ring shall completely encircle the Traffic Management System Building (buried ring).

This wire shall be solid tinned copper wire of No. 1/0 AWG or larger. The buried ring shall not be closer than 2 feet from the Traffic Management System Building foundations, and shall be exothermically welded to each ground rod. The buried ring depth shall be below the frost line of the installation site. The buried ring shall be tested after installation, and its

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resistance to earth ground shall be less than 10 ohms. The testing shall use the Biddle Instruments Model DET2/2 Digital Ground Tester or equivalent and follow all manufacturers' instructions.

The halo ground shall consist of a minimum No.2 AWG wire located approximately 6 inches below the finished ceiling and shall completely encircle the equipment room. The halo shall be utilized for equipment grounding and for grounding any other loose metals. The wire shall be green insulated stranded copper, bare stranded copper, or bare tinned solid copper. Each corner of the room shall have an omni-directional drop as indicated on the Plans. The wire size of the omni-directional drop shall be the same size and type as the halo ring. If solid tinned wire is used, the drop shall be one continuous wire and connected to the buried ring. If insulated wire is used, the drop shall extend to the floor, and then be connected in the same manner as the halo to a solid tinned wire of the same size of which shall be attached to the buried ring.

The drop, shall leave the Traffic Management System Building and be attached to the buried ring through penetrations of 45-degree angles (to minimize ground drop bend radii). The Traffic Management System Building penetrations are expected to be no more than 1 inch in diameter. The manufacture shall connect the Traffic Management System Building to the subgrade grounding ring.

The interior ground connections of the halo ring shall utilize irreversible compression type connectors. A two-hole compression type ground lug shall be used for equipment connections. An oxidizing preventative compound shall be applied to all mechanical connections, and paint shall be removed as necessary to insure positive bounding of all grounded equipment.

All external, buried connections shall be of the exothermically welded type. These include, but are not limited to, halo drops to ground rods, buried ring to ground rod, and halo drops to the buried ring.

The manufacture shall provide and implement all Traffic Management System Building grounding necessary on the interior to accommodate the associated power and lightning protection systems as indicated in the plans.

There shall be driven ground rods located at each comer of the Traffic Management System Building as indicated in the Plans. The rods shall be made of copper clad high-strength steel with minimum dimensions of 3/4 inch by 10 feet. The rods shall be located at least 2 feet from the edge of the foundations, and driven such that the top of the rod is below the frost line of the installation site. The rods shall be exothermically welded to the buried ring.

A copper grounding plate located inside the Traffic Management System Building shall be the connection point for system grounding and be directly connected to the buried ring.

The utility ground conductors for the Traffic Management System Building system ground

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shall be bonded at the service disconnect switch. All utility or service grounding shall conform to Article 250 of the National Electric Code.

The raised access floor shall have a grounding ring wire laid under the raised access floor and on top of the Traffic Management System Building concrete floor. Each floor pedestal assembly shall be connected to the floor ground ring. The floor ground ring will not be connected to the Traffic Management System Building grounding system, electrical grounding system, or lightning protection system.

22. Electric Service
The meter enclosure necessary for the Traffic Management System Building shall be obtained from Utility Company to coordinate the meter enclosure, weather head, conduits, and wire from the underground service through the meter enclosure to the service disconnect switch.

The electric service for the Traffic Management System Building shall be an underground line in conduit from an adjacent utility pole-mounted transformer, or pad-mounted transformer. The Contractor shall coordinate and provide the underground service from the adjacent pole to a new power meter installed at the Traffic Management System Building location. The Contractor shall obtain the State electrical permit for the Traffic Management

System Building and the service connection. The service to the Traffic Management System Building shall be 120/208 VAC, 3-phase, 250 amp.

23. Generator.
The work shall include obtaining and installing a generator and all necessary conduit and wiring to connect the generator to the Traffic Management System Building automatic transfer switch. This work shall include all necessary conduits, wires, enclosures, equipment, materials, and personnel. The generator shall be as specified within Section 614 Traffic Management System Building Generator.

24. UPS.
The work shall include sizing, obtaining, and installing a UPS system, all associated accessories, and all necessary conduit, pathways, and wiring to connect the UPS to the Traffic Management System Building UPS panel. The UPS shall conform to the minimum specifications within Section 614 Traffic Management System Building UPS.

25. Lightning Protection. The Manufacture shall provide a complete lightning protection system as shown in the Plans and as specified herein.

26. Traffic Management System Building Environmental Monitoring and Alarming

27. The Traffic Management System Building shall contain sensors for detecting:

    A. Over and under temperature conditions

    B. Prime power loss

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C. Smoke alarm

D. Door open

E. Air conditioner / heater failure

All discrete alarm outputs shall be wired to a terminal block located at an equipment rack. The terminal block terminals and wires shall be labeled so as to designate the alarm. The terminal block shall be documented in the electrical schematics as well.

Smoke alarm with a dual chamber ionization detector and an alarm relay module installed in a UL listed junction box. The smoke alarm shall be 120 V AC and UL listed. Over and under temperature alarms shall be a bimetallic coil sensing element and an adjustable temperature range of -1 ° C to 43 ° C. The temperature alarm shall have gold-plated, normally open, dry alarm contacts and shall be UL listed.

28. Traffic Management System Building, Ventilation, and Air Conditioning (HVAC) Equipment The work shall include obtaining and installing a generator and all necessary conduit and wiring to install the HVAC in the Traffic Management System Building. This work shall include all necessary conduits, wires, enclosures, equipment, materials, and personnel. The HVAC equipment shall be as specified within Section 614 HVAC.

(j) *Boxes.*

Outlet Boxes shall conform to the following requirements:

1. Provide galvanized or cadmium-plated pressed steel outlet boxes suitable for the conditions of each outlet. Provide multi-gang outlets of single box design; sectional boxes will not be acceptable.
2. Provide deep type cast metal outlet boxes located in damp locations exposed to weather or exposed areas subject to damage, complete with gasketed cover and threaded hubs.
3. Provide outlet boxes of sufficient volume to accommodate the number of conductors entering the box in accordance with the requirements of NFPA 70, and not less than 1-1/2 inch deep unless shallower boxes are required by structural conditions and are Approved by the Department.
4. Provide 4 inch octagonal ceiling outlet boxes.

Pull and Junction Boxes shall conform to the following requirements:

1. Provide galvanized sheet metal boxes conforming to NEMA OS 1. Provide hinged enclosures for all boxes larger than 12 inches in a single dimension.
2. Provide cast metal boxes for outdoor and wet locations conforming to NEMA 250; Type 4 and Type 6, flat-flanged, surface-mounted junction box, UL listed as rain tight with cover and ground flange, neoprene gasket, and stainless steel cover screws.

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(k) *Wire and Cable.*

Building wire shall conform to the following requirements:

Thermoplastic-Insulated Building Wire: NEMA WC 5.

1. Feeders and Branch Circuits Larger Than No. 6 AWG: Copper, stranded conductor, 600 volt insulation, THW, THHN/THWN, XHHW, RHW, UNO.
2. Feeders and Branch Circuits No. 6 AWG and Smaller: Copper conductor, 600 volt insulation, THW, THHN/THWN; smaller than No. 8 AWG, solid conductor, UNO.Control Circuits: Copper, stranded conductor 600 volt insulation, THW, THHN/THWN. Wiring types Wiring

Connections and Splices shall conform to the following requirements:

1. Connect and splice wire No. 10 AWG and smaller with self-insulating, wire nut connectors.
2. Terminate and splice all No. 8 AWG and larger copper conductors, except for load side lugs on Class I and II switchboards, panelboards, motor control centers, fusible switches, circuit breakers, transformers and individual motor controllers with high conductivity, wrought copper, color-keyed compression connector similar to T & B Series 54100 for terminal connection; Series 54500 for two-way copper-to-copper splices; and Series 54700 for tapping and pigtailing copper conductors.
3. Set screw type connectors are only acceptable on the load side lugs of Class I and II switchboards, panelboards, circuit breakers, fusible switches and on individual motor controllers.
4. Where three or more conductors larger than No. 8 AWG are installed in wiring gutter, utilize a screw-type power distribution block. Utilize split-bolt mechanical connector, filled and taped for smooth joint, only where specifically requested by Contractor and Approved by the Department.

(l) *Grounding and Bonding Systems.*

Grounding and bonding wiring shall conform to the following requirements:

1. Stranded, copper cable. Foundation Electrodes: No. 2/0 AWG.
2. Grounding Electrode Conductor: Size to meet NFPA 70 requirements.

(m) *Automatic Transfer Switches.*

Quality Assurance for automatic transfer switches shall conform to the following regulatory requirements:

1. Conform to applicable code for standby electrical systems
2. Conform to UL 1008

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Automatic Transfer Switch materials shall conform to the following requirements:

1. Configuration: Electrically-operated, mechanically-held transfer switch; dual-motor operated.
2. Double-throw with simple over-center type linkage so that both sets of contacts move simultaneously.
3. Positively interlock, mechanically and electrically, the normal and emergency contacts to prevent simultaneous closing. Mechanically lock the switches without the use of hooks, latches, springs or semi-permanent magnets.
4. Provide separate arcing contacts for all poles. Molded case circuit breakers or contactors will not be acceptable. Provide brush type main contacts of silver alloy protected by arc barriers and arc quenchers.
5. Equip transfer switch with permanently attached, safe, dead-front manual operator with same transfer speed as electrical operator to prevent flashovers.
6. Provide sturdily built operating mechanism of industrial type components which does not depend on critical electrical or mechanical adjustments. Use of miniature type limit switches and nonindustrial type components will not be acceptable.
7. Provide silver alloy contacts with a minimum rating of 10 amperes on all relays. Provide industrial type control that meet or exceed NEMA and IEEE standards and are field adjustable and have replaceable contacts.
8. Ratings: Voltage: 120/208 volt 3-phase, 3-pole with solid neutral and ground, 60 hertz.
9. Automatic Sequence of Operation:
   A. Initiate transfer of load to alternate source: Upon initiation by normal source monitor and permission by alternate source monitor.
   B. Monitor before transfer to alternate power source: Frequency and voltage to be within acceptable limits.
   C. Monitor normal source of power by use of voltage sensitive relays in each switch. Adjust relays to detect failure when a phase or leg drops below
   D. 70 percent of normal voltage and sense restoration when all phases or legs have returned to at least 90 percent of normal voltage.
   E. Provide close differential (90 percent dropout and 95 percent pickup) relays on connected load which will prevent transfer of load to emergency source upon a voltage frequency drop until it has reached at least 90 percent of rated voltage and frequency.
   F. Provide a solid state timer to signal the generator to start after an adjustable time delay of 0.5 to 6 seconds. Provide lockout relay to prevent transfer until the generating set has reached 90 percent of voltage rating and frequency.
   G. Time delay before transfer to emergency power: Provide adjustable time delay of 0 to 60 seconds on transfer to emergency.
   H. Initiate retransfer load to normal source: Upon permission by normal source monitor.
   I. Time delay before transfer to normal power: Provide an adjustable time delay on retransfer (0 to 25 minutes); factory set at 5 minutes, to assure a stable normal source before returning the load to the normal source. Include a bypass circuit switch to override time delay in the event of simultaneous failure of the emergency source and availability of a suitable normal source.
   J. Time delay on retransfer: Provide an adjustable time delay between opening of emergency contacts and closing of normal contacts to allow motor loads to decay.

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K. Time delay on engine shutdown: Provide an adjustable time delay on retransfer to normal (0 to 5 minutes); factory set at 5 minutes.

10. Enclosure: Type 1

(n) *Accessories.*

1. Indicating Lights: Mount in cover of enclosure to indicate normal source available, alternate source available, switch position.
2. Test Switch: Mount in cover of enclosure to simulate failure of normal source.
3. Return to Normal Switch: Mount in cover of enclosure to initiate manual transfer from alternate to normal source.
4. Transfer Switch Auxiliary Contacts: One normally open; one normally closed.
5. Normal Source Monitor: Monitor each line of normal source voltage and frequency; initiate transfer when voltage drops below 85 percent or frequency varies more than 5 hertz from rated nominal value.
6. Alternate Source Monitor: Monitor alternate source voltage and frequency; inhibit transfer when voltage is below 85 percent or frequency varies more than 5 hertz from rated nominal voltage.

CONSTRUCTION REQUIREMENTS

Shop drawings shall be submitted for approval on all components of the Traffic Management System Building.

Foundation and generator slab drawings and calculations shall be submitted for approval.

The Contractor shall provide a block out in the Traffic Management System Building slab for six 3-inch communications conduit to enter the building sub-floor.

Measurement will be based on one complete Traffic Management System Building delivered and installed with an operational electrical system and an operational generator system. Delivery of the Traffic Management System Building shall also include all warranty and equipment documentation. All equipment necessary for the delivery and installation of the Traffic Management System Building at the site shall be included. The Traffic Management System Building shall be installed, tested, electrical system installed and all Traffic Management System Building components fully operational and integrated with CDOT CMTC prior to acceptance.

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Section 614 of the Standard Specifications is hereby revised to include the following:

DESCRIPTION

This work consists of the following:

(1) Furnish and install an access control system and associated accessories.
(2) Furnish and install an Environmental Monitoring System and associated accessories.
(3) Furnish and install racks and associated accessories for ITS and ETC equipment.
(4) Furnish and install cable pathways and associated accessories for power and communications cabling.

MATERIALS

(a) *Access Control System.*

The proposed access control system for this facility shall be interoperable with existing CDOT employee badges. A minimum of one door controller shall be provided. The control panel shall utilize one proximity reader (short read range). A surface mounted box shall be provided for housing the proximity reader. The Access Control System shall be compatible with existing CDOT access control systems.

The new card access systems via existing network equipment to the main Velocity control software at CDOT Headquarters in Denver. Interaction with on-site personnel and access to these sites shall be coordinated through the Engineer.

The Contractor shall submit product information to Engineer for Approval.

1. CDOT currently uses the Identive Velocity access control system at numerous locations statewide. Accordingly, the access control system that is provided for these traffic management system building locations shall be interoperable with existing CDOT employee badges.
2. The controller shall be the Identive Model M1N one door controller with integrated Secure Network Interface Board (SNIB).
3. The control panel shall utilize one Identive Model CR20L-BL HID proximity reader (short read range of 3.75 inches).
4. Identive Model MB2 surface mounting boxes shall be provided for housing the proximity reader.
5. The locking mechanism shall utilize magnetic locks with a minimum resistance of 500 pounds. The failsafe mode shall be open. An internal push bar shall be installed on the door to allow for egress at all times.
6. The building equipment shall include the following:
   A. Identive M1N Model 1 single door controller
   B. Identive LIF-D1SP Ethernet to serial device server
   C. Identive MRIA match reader interface assembly
   D. Identive MB2 surface mount back box for MRIA
   E. Identive CR20L-BL pox point reader
   F. Identive MELM2 end of line module

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G. Altronix AL125ULX lock power supply
H. 12 volt 5 amp hour SLA batteries
I. GE / Sentrol 1078C recessed door contact
J. Command Access CL93DEU REX electrified Best 9K lock with rex switch
K. RCI 9508-12S armored door transfer loop
L. Small Format Interchangeable Core (SFIC) core keyway for electric lockset
M. Cable, connectors and miscellaneous hardware

7. The Contractor is required to submit cut sheet submittals for all items included in this work for approval by the Department prior to installation.
8. The work shall include the following elements:
   A. Provide and install M1N controller and lock power supply inside the Traffic Management System Building on wall near entry door.
   B. Connect 120 volts alternating current power to the M1N controller and lock power supply. Provide and install surface mounted conduit from the M1N panel to the reader, electric lock and network rack.
   C. Provide and install MRIA, card reader, door contact and electric lock set with rex switch on door.
   D. Provide and install cabling to devices on door from M1N panel. Terminate cabling to devices and M1N panel.
   E. Provide and install Cat5e cabling from M1N panel to network rack.
   F. Program new panel and door into existing Velocity software.
   G. Install final connections to the main control equipment for the above referenced systems.
9. The Contractor shall submit requests to the Engineer to store cable and equipment on site. These requests will be reviewed and Approved by the Engineer on a site-by-site basis.
10. The Contractor is required to provide cabling diagrams showing the connectivity of all equipment that is to be installed as part of this item. These diagrams shall be provided prior to any cabling work for final approval by the Department.
11. CDOT will make all connections to the existing Ethernet equipment, but this equipment shall be included in the cabling diagram as it pertains to device connection.
12. The Contractor shall notify the Engineer a minimum of 48 hours in advance of any work that is to be performed in the Traffic Management System Building. The static internet protocol (IP) address for any given traffic management system building will be provided by CDOT. The Contractor shall notify the Engineer a minimum of 48 hours in advance regarding requests for this information.
13. The Contractor shall bring the panel online and test for proper operation. The Contractor shall conduct final testing and inspection for the above referenced systems. Instruction shall be provided that will help enable members of the CDOT Intelligent Transportation Systems (ITS) Branch to create and maintain access for all applicable card holders that require access to a given traffic management system building. Instruction shall also be provided that will help enable members of the ITS Branch to monitor the on-going access that is occurring at a given traffic management system building.

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(b) *Mechanical Systems (Environmental Monitoring System).*

For this Project, the Mechanical Systems item shall be for the provision and installation of an Environmental Monitoring System for traffic management system buildings, as specified in the plans.

The Environmental Monitoring System shall also have a backup wireless communication system that will allow for continued monitoring if the primary communication system fails. A wireless cellular data modem, associated power supply, cellular antenna, antenna cable, communication cable, and any necessary mounting hardware shall be furnished and installed by the Contractor.

Interaction with on-site personnel and access to these sites shall be coordinated through the Engineer.

The Contractor is required to submit cut sheet submittals for all items included in this work for approval by the Department prior to installation.

The Mechanical Systems equipment shall include the following:

1. Large enterprise environment monitoring system.
2. External AC power, voltage, frequency, and current monitor.
3. External temperature / humidity sensor.
4. External smoke detection sensor.
5. External spot liquid detection with single-pole double throw (SPDT) contacts.

The Environmental Monitoring System shall satisfy the following criteria:

1. The system shall include three internal sensors: temperature, humidity and power. It shall also supports 16 external configurable sensors, eight digital input sensors, and four output relays for control of external devices.
2. Sensors shall be hot pluggable.
3. Shall be able to monitor (ping) up to 64 IP network devices – alerts are sent if devices are not responding.
4. Sensor conditions (events) shall be configurable to trigger alerts by themselves, and / or be used in combination with other events to trigger Smart Alerts.
5. Redundant dual power connection.
6. Includes internal battery backup
7. Includes Universal Serial Bus (USB) ports for connecting USB modem, for downloading log data to USB flash drive, or for connecting a USB Liquid Crystal Display (LCD) screen.
8. Supports IP network video cameras for live view of any facility.
9. The capability to trigger a snapshot from an IP camera after any programmed event.
10. Includes a server based management software for monitoring and control of the remote system and sensors.

The Environmental Monitoring System shall meet the following requirements:

1. Report temperatures from 32 to 104°F (0 to 40°C)

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2. Report humidity from 20 to 80 percent relative humidity at temperatures between 32 to 104°F (0 to 40°C)
3. Measure main voltage: 0 to 255 VAC / Measure battery voltage: 0 to 20 volts direct current (VDC)
4. Ethernet Port shall be a 10/100 Base-T Ethernet port with RJ45 Ethernet connector
5. Alerts can be provided by a minimum of four methods:
   A. Email Authenticates
   B. Web Interface
   C. Simple network management protocol (SNMP) network management (V1/V2c/V3)
   D. Front Panel Light Emitting Diodes (LEDs) for internal and external sensors, backup battery, data log, power, auxiliary power
6. The system can be accessed by a minimum of five methods:
   A. Web Interface
   B. Telnet
   C. Secure Shell (SSH)
   D. Network Operation (SNMP) V1/V2c/V3
   E. RS232 (via female RJ45 RS232 connector & female USB Type B connector)
7. Shall support these protocols; HTTP/HTTPS, SNMP V1/V2c/V3, SMTP, TCP/IP, Syslog, SNTP, DHCP, SSHv2, SSLv3, LDAPv3, AES 256-bit, 3DES, Blowfish, RSA, EDH-RSA, Arcfour, IPV6, WAP 2.0
8. Shall have an operating temperature range of 32 to 100°F (0 to 38°C)
9. Shall be mountable in standard 19 inch rack.

The cellular wireless data modem shall be a standalone hardened unit designed to communicate to serial and Ethernet devices over 4G LTE and 3G wireless network. The modem shall consist of a unit capable of transmitting data by its embedded operating system and its own transmission control protocol/internet protocol (TCP / IP) stack to enable transmission of data from non-IP devices. The modem shall be capable of active/standby configuration for use as failover communication link for out of band management to network infrastructure. The modem shall meet the following minimum requirements:

1. Communication to Ethernet devices with a minimum of 1 x 10/100 RJ-45 Ethernet jacks.
2. Wireless Communications utilizing 802.11 b/g/n for connection with up to 32 devices at a time with WEP, WPA, WPA2, and AES encryption.
3. Support TCP/IP, UDP/IP, DHCP, HTTP, SNMP, SMTP, FTP, DMZ, PPPoE passthrough, DNS, DDNS, LAN/WAN affinity, VPN, VLAN support, MAC filtering, port forwarding, routing, and GPS protocols.
4. Visual light indicators that show unit status for power, cellular signal, network connection, and data activity.
5. Cellular network support for LTE at 700MHz and CDMA EV-DO rev A, 1x EV-DO rev 0, or 1xRTT at 800/1900 MHz with options for MIMO in LTE mode or receive diversity in CDMA mode.
6. Remotely upgradeable PRL, firmware, and configuration.
7. 4G cellular wireless with backwards compatibility to EV-DO rev A, A/O, CDMA 1x.
8. Built in GPS receiver with port for external antenna.
9. 50 ohm SMA antenna interfaces.
10. Operate on 9 to18 VDC at 1.5 amps or less.

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11. Operate within a temperature range of -4 to 122˚F (-30 to 70˚C) at 10 to 85 percent humidity.

The power supply shall output a nominal 12 volts direct current at a minimum of 2 amps to power the wireless cellular data modem. The power supply shall be rated to operate within a temperature range of -10 to 130˚F.

The cellular antenna shall be outdoor rated, omnidirectional, and capable of transmitting and receiving on at least 3 frequency bands: 700MHz for LTE and 800/1900 MHz with a minimum 3dBi gain. The antenna shall be have an NMO mountable base that can be used for wall mounting.

The antenna cable shall be an RG-58 coaxial cable type rated at 50 ohms. The cable shall be terminated with a male SMA on one end for connection with the wireless cellular data modem. The other end shall be terminated with the correct connector to interface with the tri band antenna.

The communication cable shall be constructed from twisted pair cable with minimum 22 gauge stranded conductors. For Ethernet communication the cable shall be terminated with 8P8C connectors with T568B pin/pair assignments.

A 19 inch rack mountable shelf shall be included for installation of the modem

The environmental monitoring system shall be installed in a 19 inch rack as shown on the Plans or directed by the Department. The liquid detection sensor shall be installed on the low point of the floor. In buildings with raised floor this will be underneath the raised floor. The temperature and humidity sensor shall be installed on the high point of the rack that the monitoring system is installed. The smoke detection sensor shall be installed in the ceiling in middle of the room.

The wireless cellular data modem shall be installed below the environmental monitor in a rack mountable shelf. The cellular antenna shall be mounted on the exterior of traffic management system buildings to get the best possible receive signal. Any cable penetrations made in the building shall be watertight and cable runs shall include drip loops to eliminate any moisture ingress into the building. A complete installation consists of the wireless cellular data modem, power supply, dual band antenna, antenna cable, communication cable, and wiring power to the unit. The Contractor shall install the power supply to the wireless cellular modem per manufactures recommendations. The Contractor shall connect the wireless cellular modem end equipment as specified in the Plans or directed by the Department. The placement of the unit shall allow provision for cable installation and maintenance as indicated on the Project Detail Sheet and manufacturer's recommendations. All electrical wiring and connections shall meet NEC standards. The Contractor is responsible for supplying all necessary cabling, connectors, and hardware for a fully functional installation.

The Contractor shall notify the Engineer a minimum of 48 hours in advance of any work that is to be performed in the traffic management system building.

The Contractor shall bring the system online and test for proper operation. The Contractor shall conduct final testing and inspection for the above referenced systems. Instruction shall be provided that will help enable members of the CDOT ITS Branch to configure the system.

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Provision and installation of the backup wireless communication system will not be measured and paid for separately, but shall be part of the Mechanical Systems item. It shall include a warranty, testing, documentation, all necessary wiring, RF antenna, communication cables, labor and other items necessary to complete the work.

(c) Cabinets (for ITS equipment)

Provide a minimum of seven freestanding equipment cabinets within the Airport Node. Six cabinets shall be used to store fiber optic termination/splice panels and associated ITS equipment and the one other cabinet shall be used for ETC equipment. Each cabinet enclosure shall have a rectangular frame with removable top panel, side panels and doors. The installed cabinets shall include horizontal and vertical cable management accessories that keep network cables organized.

Each cabinet frame shall be rectangular with four corner posts, manufactured from aluminum with bolted frame construction. The sides of the frame shall have three supports located near the top, middle and bottom to allow attachment of equipment mounting rails and cable management accessories. Each cabinet frame shall have a static load limit of 2000 pounds.

Each cabinet shall not exceed 28 inches in width (overall), 34 inches in depth (overall), and 84 inches in height (overall). Leveler feet, which are required, shall not add more than an additional 1 inch to the height of the cabinet.

Each cabinet shall include two pairs of equipment mounting rails. Mounting rails shall bolt to the supports located near the top, middle and bottom of the frame and shall be fully adjustable in depth to provide front and rear support for equipment. Equipment mounting rails shall be spaced horizontally to support 19 inch wide EIA/ECA-310 compliant rack mount equipment and shall provide up to 30 inches of rail-to-rail depth for equipment. Mounting rails shall be L-shaped. The front flange shall be #12-24 threaded according to the EIA/ECA-310 universal hole pattern with equipment mounting holes on alternating 0.625 inch – 0.625 inch – 0.5 inch vertical hole centers. Rack mount spaces or Rack Units (RU) shall be 1.75 inches high and shall be marked and numbered on the mounting rails. Numbering shall start at the bottom of the rail. Mounting rails shall provide 45 RU of usable vertical panel space for equipment installation.

Each cabinet shall include a solid top panel with a vented section for a top-mount fan near the front and rear of the panel and edge-protected cable access ports along the right and left sides of the panel. Two locking side panels with keyed latches shall be provided. Each cabinet shall include a single front door with a perforated metal panel and quick-release hinge pins. The front door shall be removable and reversible to open from the right or left. The front door shall have a single point, spring loaded, push button latch with a keyed lock. Each cabinet shall include a single rear door with a perforated metal panel and quick release hinge pins. The rear door shall be removable and reversible to open from the right or left. The rear door shall have a single point, spring loaded, push button latch with a keyed lock that matches the front door of the cabinet. Cabinets for ETC equipment shall be keyed differently than cabinets containing ITS equipment. The keyed lock for the ETC equipment cabinet shall be the same for the front and rear doors. The cabinet frame, top panel, side panels, and doors for the cabinet shall be manufactured from aluminum. The door latch, door hinges, and top panel cable access ports may be plastic. The cabinet frame and door frames shall be anodized aluminum. The top panel, side panels, mounting rails, and door panels shall be

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painted gray with powder coat paint. Plastic components shall be black. The cabinet frame shall assemble with hardware provided by the cabinet manufacturer.

Each cabinet shall be UL Listed as a Communications Circuit Accessory to standard UL 1863 Communications Circuit Accessories under category DUXR.

Each cabinet shall include four leveling feet, four clamps for securing the leveling feet to the floor, and a means for bonding the cabinet to the existing Telecommunications Grounding Busbar (TGB) in the Traffic Management System Building.

Each installed cabinet shall be equipped with a vertical cable manager to store network cables. The vertical cable manager shall attach to the side of the cabinet frame in the space between the frame and the side panel and shall be adjustable in depth to match equipment requirements. The vertical cable manager shall have individual C-shaped plastic cable rings. The rings shall be able to align with the side or the front/rear of the cabinet.

Each installed cabinet shall be equipped with rack mount horizontal cable managers to organize cables in the RU above and below each patch or splice panel and/or Ethernet switch within the cabinet. Each horizontal cable manager shall be 19 inch EIA/ECA-310 compatible and not more than 2 RU high. The horizontal cable manager shall be a single sided U-shaped trough with a front facing snap on cover. Plastic T-shaped cable guides along the top and bottom edge of the cable manager shall divide cable openings that allow cables to exit or enter the top or bottom of the manager. The cable manager shall be sized to hold 24 patch cords per RU and have a depth that allows the cabinet door to be securely closed without crushing or putting undue pressure on fiber optic patch cords.

Each cabinet shall be equipped with two vertical mount (zero U) Power Distribution Units (PDUs), including vertical PDU mounting brackets, as required. Each PDU shall be on a separate electrical circuit and backed up by the building UPS. The PDUs shall be designed in accordance with the applicable sections of UL 60950-1 (Active/Most Current Edition): Information Technology Equipment – Safety. PDUs shall be rated for 30A of integral branch overload protection, with 120V input and output. Single phase input power shall be provided via a minimum 10 foot power cord with appropriate locking input plug connection. PDUs shall be equipped with 27 NEMA 5-20R power outlets. PDUs shall be equipped with upgradable network communications to support remote monitoring and/or control capabilities. PDUs shall provide local and remote monitoring of individual PDU volts, amps, watts, and kilowatt-hours and provide user positioned LCD status display for local monitoring. Vertical mount dimensions shall not exceed 69 inches (H) x 2 inches (W) x 4 inches (D). The PDUs shall be rated for operation at ambient temperatures of 32°F to 131°F for altitudes 10,000 feet above sea level with a relative humidity of 0% to 95%, non-condensing and non-corrosive. Each PDU shall include a user's manual that contains installation drawings and instructions, a functional description of the equipment, safety precautions, illustrations, and operating procedures. The manufacturer shall warrant each PDU against defects in materials and workmanship for a minimum period of two (2) years. Before shipment, the manufacturer shall fully and completely test each PDU to assure compliance with the specification. The manufacturer shall submit certified test reports showing the results of the factory testing that shall be included in each shipping box containing a PDU.

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Each cabinet shall be equipped with a top mount fan kit to help remove hot air from within the cabinet. The fan kit shall include four 100 cfm fans in two housings that attach to the cabinet's top panel. The fan kit shall include a single attached 15 feet long power cord with a molded NEMA 5-15P.

One universal cabinet light shall be furnished and installed at the top, rear of each cabinet. The universal cabinet light shall be EIA/ECA-310 compliant for 19 inch racks and not exceed 1 RU in height. It shall be mounted with the light source facing into the cabinet to direct illumination downward. The light source shall be fluorescent or LED and not exceed 8 W of power consumption from a 115 VAC source. A lens shall be provided to protect the light source from accidental contact and must be either clear or white. Each universal cabinet light shall include an on/off switch and a minimum 6 feet of power cord.

The Contractor shall provide a minimum of 100 additional #12-24 equipment mounting screws for future use by the Department to attach equipment to the equipment mounting rails in the cabinet. The screws shall be contained in a bag and stored in an identifiable location within the cabinet.

The Contractor shall install and adjust to position all accessories including vertical cable managers, equipment mounting rails, etc. using the cabinet manufacturer's installation instructions.

When a cabinet supports active electronic equipment, any type of shielded cable, or cable termination device requiring a ground connection, the Contractor shall furnish and install a rack mount horizontal bus bar to the cabinet in order to provide multiple bonding points on the cabinet for the cabinet and its rack mounted equipment. A horizontal rack mount busbar shall be constructed of a minimum 0.1875 inch thick by 0.75 inch high hard-drawn electrolytic tough pitch 110 alloy copper bar. The bar shall be 19 inch EIA/ECA-310 compatible for mounting on the back side of cabinets and installed per the manufacturer's installation instructions. The bar shall have a minimum of eight 6-32 tapped ground mounting holes on 1 inch intervals and four 0.281 inch holes for the attachment of two-hole grounding lugs. Each bar shall include a copper splice bar of the same material (to transition between adjoining cabinets) and two each 12-24 by 0.75 inch copper-plated steel screws and flat washers for attachment to the cabinet. The bar shall be UL Listed as grounding and bonding equipment. All active electronic equipment installed within the cabinets that can be grounded shall be bonded to the bus bar using a minimum #6 AWG stranded green insulated Type MTW conductor with a yellow helical stripe of appropriate length. All cabinets shall be securely bonded to each other and to the TGB in the node, unless otherwise specified by the Department. Attach an appropriately sized bonding conductor sized, per TIA-607, or as defined by local code or the Department between the TGB and each cabinet. Attach the bonding conductor to the cabinet using included hardware according to the cabinet manufacturer's installation instructions. The Contractor shall provide the bonding conductor, compression lugs, antioxidant, and all necessary hardware required to make the connections between each cabinet's equipment and its busbar and between cabinets and the TGB.

(d) Cable Pathways (for communications cabling)

This section includes the minimum requirements for the cable ladder installations in new Traffic Management System Buildings. Included in this section are the minimum composition requirements and installation methods for the cable ladders.

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All cable and equipment shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated herein shall be subject to the control and approval of the Department. Equipment and materials shall be of the quality and manufacture indicated. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval. Strictly adhere to all American National Standards Institute (ANSI), Building Industry Consulting Service International (BICSI), Electronic Industries Alliance (EIA), National Electrical Contractors Association (NECA), National Electrical Manufacturers Association (NEMA), National Fire Protection Association (NFPA), and Telecommunications Industry Association (TIA) recommended installation practices when installing communications/data cabling. Material and work specified herein shall comply with the applicable requirements of: TIA – 569-B Commercial Building Standard for Telecommunications Pathways and Spaces; ANSI/TIA – 568-C Commercial Building Telecommunications Cabling Standard; ANSI/NECA/BICSI 568 – Standard for Installing Commercial Building Telecommunications Cabling; TIA – 606-A Administration Standard for Commercial Telecommunications Infrastructure; ANSI-J-STD – 607-A Joint Standard for Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications; ANSI/TIA-942 Telecommunications Infrastructure Standard for Data Centers; NFPA 70 – National Electric Code; NEMA – VE 1 – Metal Cable Tray Systems; and NEMA – VE 2 – Metal Cable Tray Installation Guidelines. Provide product data for the following: manufacturers data/cut sheets, specifications and installation instructions for all products.

Ladder rack shall be manufactured from tubular steel. Stringers (sides) should be made from 3/8" wide by 1-1/2" high tubular steel with 0.065" wall thickness. Cross members (rungs) should be made from 1" wide by ½" high tubular steel with 0.065" wall thickness. Ladder rack (stringers) should be 9'-8½" long. Cross members should be welded in between stringers on 9" centers beginning 4-1/4" from one end so that there are thirteen cross members per ladder rack. There should be 8" of open space in between each cross member. Ladder rack should be delivered individually boxed, and shall be available in widths as required for the size and amount of cables being installed as part of this Project plus 100% spare capacity. Ladder rack shall be UL Classified for suitability as an equipment-grounding conductor, unless otherwise specified by the Department. Minimum combined cross sectional area of the stringers will be 0.40 square inches. A label affixed to the side stringer of the ladder rack shall identify the manufacturer, the UL Classification and the minimum combined cross sectional area of the stringers. Finish shall be gold chem. over zinc plating.

Horizontal 90° turns should be factory-fabricated, made from 3/8" wide by 1-1/2" high tubular steel with 0.065" wall thickness. Stringers (sides) should be curved to allow a smooth horizontal 90° turn. Cross members should be welded in between stringers on approximate 23° increments so that there are 5 cross members per turn. Horizontal 90° turns shall be available in widths as required for the size and amount of cables being installed as part of this Project plus 100% spare capacity. Horizontal 90° turns shall be UL Classified for suitability as an equipment-grounding conductor, unless otherwise specified by the Department. Minimum combined cross sectional area of the stringers should be 0.40 square inches. A label affixed to the side stringer of the horizontal 90° turn

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shall identify the manufacturer, the UL Classification and the minimum combined cross sectional area of the stringers. Finish shall be gold chem. over zinc plating.

Vertical-to-horizontal 90° turns should be factory-fabricated, made from 3/8" wide by 1-1/2" high tubular steel with 0.065" wall thickness. Stringers (sides) should be curved to allow a smooth vertical-to-horizontal transition. Cross members should be welded in between stringers on approximate 23° increments so that there are 3 cross members per turn. Vertical-to-horizontal 90° turns shall be available in several widths as required for the size and amount of cables being installed as part of this Project plus 100% spare capacity. Vertical-to-horizontal 90° turns shall be UL Classified for suitability as an equipment-grounding conductor, unless otherwise specified by the Department. Minimum combined cross sectional area of the stringers should be 0.40 square inches. A label affixed to the side stringer of the vertical-to-horizontal 90° turn shall identify the manufacturer, the UL Classification and the minimum combined cross sectional area of the stringers. Finish shall be gold chem. over zinc plating.

Horizontal-to-vertical 90° turns should be factory-fabricated, made from 3/8" wide by 1-1/2" high tubular steel with 0.065" wall thickness. Stringers (sides) should be curved to allow a smooth horizontal-to-vertical transition. Cross members should be welded in between stringers on approximate 23° increments so that there are 3 cross members per turn. Horizontal-to-vertical 90° turns should be available in several widths as required for the size and amount of cables being installed as part of this Project plus 100% spare capacity. Horizontal-to-vertical 90° turns shall be UL Classified for suitability as an equipment-grounding conductor, unless otherwise specified by the Department. Minimum combined cross sectional area of the stringers should be 0.40 square inches. A label affixed to the side stringer of the vertical-to-horizontal 90° turn shall identify the manufacturer, the UL Classification and the minimum combined cross sectional area of the stringers. Finish shall be gold chem. over zinc plating.

Corner brackets should be factory-fabricated, made from 3/8" wide by 1-1/2" high tubular steel with 0.065" wall thickness. The inside stringers of the corner bracket should form a 90° corner. The outside stringer of the corner bracket should be formed as a 90° radius. Corner brackets shall be available in sizes as required for the size and amount of cables being installed as part of this Project plus 100% spare capacity. Installation hardware shall be included with the intersection radius. Finish shall be gold chem. over zinc plating.

A method shall be provided for splicing ladder rack sections and fabricated turns together end-to-end or side-to-end to form a continuous pathway. Splices shall be UL Classified and must electrically bond pathway components. No accessory grounding kit should be required. Splices should be manufactured from steel or aluminum. Splice kits shall include installation hardware. Finish shall be gold chem. over zinc plating.

Supports shall be sized to match the width of the ladder rack that is supported. Support design shall allow the support to be placed under the ladder rack at any point mid-span, but not under a ladder rack splice. Each support should be punched with a pattern of holes that allows attachment of ladder

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rack to the support. Each support shall include a pair of J-bolts (and hardware) appropriately sized for securing ladder rack to the support. Supports should be manufactured from steel or aluminum. Finish shall be gold chem. over zinc plating.

Cable straps used for attaching cable bundles to the ladder rack cross members shall be reusable with a hook and loop-style closure, at least 3/4" wide, and sized for cable bundles that are 2", 3" or 4" in diameter. Cable retaining posts used to keep cable from falling off of the side of the ladder rack should be manufactured from 1" by 1/2" tubular steel with 0.065" wall thickness. Cable retaining posts should be 8" high and should attach to the side stringer of the ladder rack with included hardware. The top of the cable retaining posts shall be fitted with a rubberized end cap to protect cables. End caps used to cover the ends of ladder rack shall be manufactured from a black fire-retardant rubberized material. End caps should be sized for 3/8" wide by 1-1/2" high side stingers and should be sold in pairs. End closing kits used to cover the end of ladder rack should be manufactured from 3/8" wide by 1-1/2" high tubular steel with 0.065" wall thickness. Kits shall consist of a bar cut to match the width of the ladder rack and the hardware required to attach the bar to the end of a length of ladder rack. Radius drops used to create a radius to form cables over as the cables exit or enter the ladder rack should be manufactured from aluminum extrusion. The extrusion should be formed in a 90° arc with a minimum bend radius consistent with the required bend radius of the cables being installed. Radius drops should attach to either the side stringer or the cross member of the ladder rack using a clevis pin. Radius drops should include 1-1/2" high cable spools that attach to the top of the radius drop to guide cables. Movable cross members used to support cross member radius drops in between welded cross members on ladder rack should be manufactured from 3/8" by 1-1/2" aluminum bar. Movable cross members shall attach to ladder rack at the side stringers with included hardware so that the location of the movable cross member can be adjusted. Moveable cross member shall support a cross member radius drop. Cable spools used to separate ladder rack into multiple cable pathways shall be made from a black flame retardant plastic material. Cable spools shall attach to the cross members with a clip that allows the width of the ladder rack to be divided into any proportion. The spools should be about 4" tall, with a 2" diameter top cap, and a body that tapers from the top to the bottom. Auxiliary support brackets used to support cables that should be physically separated from the cables in the ladder rack should be made from 1/8" by 1" steel bar. The bracket should be L-shaped and attach to the side stringer of the ladder rack. The bracket should hang below the ladder rack a minimum of 4". The bracket support surface should be 4" long. The bracket shall be zinc plated with a gold chem. finish.

All components of the ladder rack system (ladder rack, turns, splices, supports, and accessories) shall be from a single manufacturer. Ladder rack shall be installed with side stringers facing down so that the ladder forms an inverted U-shape and so that welds between the stringers (sides) and cross members (middle) face away from cables. Ladder rack shall be secured to the structural ceiling, building truss system, wall, floor or the tops of equipment cabinets using the manufacturer's recommended supports and appropriate hardware as defined by local code or the Department. Ladder rack shall be supported every 5' or less in accordance with TIA-569-B. Ladder rack shall be supported within 2' of every splice and within 2' on both/all sides of every intersection. Support ladder rack within 2' on both sides of every change in elevation. Support

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ladder rack every 2' when attached vertically to a wall. Secure ladder rack to each support with included hardware so that, at a minimum, ladder rack is connected to each support by two fasteners. Ladder rack splices shall be made in mid-span, not over a support, with the manufacturer's recommended splice hardware. Heavy-duty splices shall be provided for ladder racks in excess of 18" width. Heavy-duty splices are required for any splice formed in the vertical orientation including changes in elevation formed using vertical-to-horizontal 90° turns or horizontal-to-vertical 90° turns. Use heavy-duty splices to secure all overhead turns to the overhead horizontal pathway(s). When the pathway is overhead, ladder rack shall be installed with a minimum clearance of 12" above the ladder rack. Leave a minimum of 3" in between ladder rack and the tops of equipment cabinets. When installed under a raised floor, ladder rack shall be installed with a minimum 3" clearance between the top of the ladder rack and the bottom of the floor tiles or floor system stringers, whichever is lower in elevation. Maintain a minimum 3" clearance between ladder racks wherever ladder racks cross. Within each Traffic Management System Building, ladder racks shall be electrically continuous and bonded to the Telecommunications Grounding Busbar (TGB), unless otherwise specified by the Department. Ladder rack shall be bonded to the TGB using an approved ground lug on the ladder rack and a minimum #6 AWG grounding wire or as recommended by the Department. The quantity of the installed cables within the ladder rack shall not exceed a whole number value equal to 50% of the interior area of the ladder rack divided by the cross-sectional area of the cable. The interior area of ladder rack shall be considered to be the width of the ladder rack multiplied by a height of 2", unless cable retaining posts are added to the ladder rack. The interior area of ladder rack equipped with cable retaining posts shall be considered to be the width of the ladder rack multiplied by a height of 6". Actual cable fill for ladder rack that is not equipped with cable retaining posts shall not exceed 2" in height. Actual cable fill for ladder rack equipped with cable retaining posts shall not exceed 6" in height. The combined weight of cables within the ladder rack shall not exceed the stated load capacity of the ladder rack as stated in the manufacturer's product specifications or design tables. Cables (cable bundles) shall be secured to the cross members of ladder rack with ¾" wide reusable straps. Straps are not required when ladder rack is equipped with cable retaining posts. When cable fill exceeds 2" in height or when cable bundles cannot be secured directly to the ladder rack cross members with a strap, add 8" high cable retaining posts to the open sides of the ladder rack. Cable fill within any ladder rack should not exceed 6" in height. Cover the exposed ends of cable runway that do not terminate against a wall, the floor or the ceiling with fire-retardant black colored end caps made from a rubberized material or an end closing kit consisting of a flat bar of ladder rack stringer material factory cut to the width of the ladder rack and secured to the ladder rack with a junction splice kit. Separate different cable media types within the ladder rack pathway. Treat each type of cable media separately when determining cable fill limits. Where cable exits or enters the side of overhead ladder rack to access a cabinet or termination panel, a radius drop shall be used to guide the cable. Maintain a minimum separation of 2' between ladder rack used for communications cables and pathways for other utilities or building services. The installer shall correct any minor cosmetic damage (chips, small scratches, etc.) resulting from normal handling during the installation process. If a component is cosmetically damaged to the extent that correction in the field is obvious against the factory finish, the component shall be replaced with a new component finished from the factory. If a component is

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physically damaged due to mishandling or modification during the installation process, it shall not be used as part of the ladder rack system.

CONSTRUCTION REQUIREMENTS

All cable and equipment shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the Contract Documents shall be subject to the control and approval of CDOT or CDOT's designated representative. Equipment and materials shall be of the quality and manufacture indicated.

Strictly adhere to all Building Industry Consulting Service International (BICSI), National Electrical Contractors Association (NECA), National Fire Protection Association (NFPA) and Telecommunications

Industry Association (TIA) recommended installation practices when installing communications/data cabling and grounding.

Provide product data for the following: Manufacturers data sheets/cut sheets, specifications and installation instructions for all products.

(c) *Field Quality Control.*

1. Inspect wire and cable for physical damage and proper connection.
2. Torque test conductor connections and terminations to manufacturer's recommended values.
3. Inspect and test in accordance with NETA ATS, except Section 4.
4. Grounding and Bonding: Perform inspections and tests listed in NETA ATS, Section 7.13.

(d) *Grounding and Bonding Installation.*

1. Bond together each metallic raceway, pipe, duct and other metal object entering space under access floors. Bond to underfloor ground grid. Use 2 AWG bare copper conductor.
2. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.
3. Interface with site grounding system installed.
4. Locate and install anchors, fasteners, and supports in accordance with NECA "Standard of Installation".
5. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.
6. Do not use spring steel clips and clamps.
7. Do not use powder-actuated anchors.
8. Do not drill or cut structural members.

(e) *Equipment Ground.*

1. Provide complete ground system for building consisting of copper cable, ground rods, and exothermic connections to serve service entrance, building structural steel, metallic enclosures, and conduit systems.

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2. Provide separate, insulated equipment grounding conductor from main service ground to each main switchboard and in feeders and branch circuits. Terminate each end a grounding lug, bus, or bushing. Do not use conduit as grounding conductor.
3. Provide bonding jumper at expansion joints, points of electrical discontinuity, or connections in conduit where firm mechanical bond is not possible, such as flexible connections and insulating couplings.
4. Ground each lighting and power panelboard by connecting grounding conductor to grounding stud.
5. Bond every new item of equipment served by electrical system to building equipment ground system including switchboards, panelboards, disconnect switches, receptacles, controls, fans, air handling units, pumps, and flexible duct connections.

(f) *Access Control System.*

2. Test the system to determine that it is free from grounds, open and short circuits.
3. Test system in accordance with manufacturer's recommendations in presence of Owner's representative:
   A. Operate initiating devices.
   B. Verify device operation.
   C. Verify signal operations.
   D. Verify system responds properly

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Section 614 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

This work consists of furnishing and installing a Traffic Management System Building Uninterruptible Power Supply (UPS) and associated accessories.

Additional floor space adjacent to the Traffic Management System Building UPS, provided as part of this Project, shall be reserved when sizing the Traffic Management System Building for the future addition of a similar UPS for a 1+1 configuration. The future UPS shall be connected in parallel to the UPS provided as part of this Project for extra capacity.

MATERIALS

(a) *Standards.*

The UPS shall be designed in accordance with the applicable sections of the current revision of the following documents. Where a conflict arises between these documents and statements made herein, the statements in this specification shall govern.

1. UL Standard 1778
2. IEEE C62.41.1, Category A & B
3. National Electrical Code (NFPA 70)
4. ANSI/IEC 60529-2004 Degrees of Protection Provided by Enclosures (IP Code)

(b) *Modes of Operation.*

The UPS shall operate as a true on-line system:

1. Normal - The critical alternating current (AC) load shall be continuously supplied by the UPS inverter. The input converter shall derive power from a utility AC source and shall supply direct current (DC) power to the inverter. The battery charger shall maintain a float-charge on the battery.
2. Back-up - Upon failure of utility AC power the critical AC load shall be supplied by the inverter. In this mode the inverter shall be powered from the battery. There shall be no interruption in power to the critical load upon failure and restoration of the utility AC source.
3. Recharge - Upon restoration of utility AC power, the input converter shall automatically restart and resume supplying power to the inverter. The battery charger shall resume recharge of the battery.
4. Automatic Restart - After a utility AC power outage and complete battery discharge, the UPS shall automatically restart and resume supplying power to the critical load. In addition, the

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battery charger shall automatically recharge the battery. This feature shall be enabled (factory default) and shall be capable of being disabled by the user. The user shall also be able to program two auto restart delay settings:

A. Battery capacity percent level

B. Countdown timer

5. Bypass - The bypass shall provide an alternate path for power to the critical load and shall be capable of operating in the following manner:

A. Automatic - In the event of an internal failure or should the inverter overload capacity be exceeded, the UPS shall perform an automatic transfer of the critical AC load from the inverter to the bypass source.

B. Manual - Should the UPS need to be taken out of service for limited maintenance or repair, manual activation of the bypass shall cause an immediate transfer of the critical AC load from the inverter to the bypass source. The input converter, inverter, and battery charging operations shall continue to operate, provided the control enable switch is in the "On" position.

(c) *Performance Requirements.*

1. System

A. Input to output isolation shall be provided via the output transformer, regardless of the operating mode. (UPS or bypass)

B. The UPS shall provide provisions for remote stop (Emergency Power Off) capability.

6. AC Input to UPS shall conform to the following:

A. Voltage Configuration: 120/208-VAC 3-Phase. The operating voltage range shall be variable based upon output loading percentages as follows:

% UPS Load	Input Voltage
80 – 100%	170 VAC
60 – 80%	144 VAC
30 – 60%	127 VAC
0 – 30%	110 VAC

B. Frequency: 40 to 70 Hz.

C. Input Current Distortion: 5 percent Total Harmonic Distortion (THD) maximum at full load.

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D. Input Power Factor: 0.98 lagging at 100 percent rated load.

E. Inrush Current: 150 percent of full load input current maximum for three cycles.

F. Surge Protection: Shall sustain input surges without damage per criteria listed in IEEE C62.41, Category B.

(d) *AC Output shall conform to the following:*

1. Voltage Configuration: 120/208-VAC 3-Phase.

2. Voltage Regulation: +/- 3 percent steady state.

3. Frequency Regulation: 60 Hz, +/- 0.5 percent.

4. Frequency Slew Rate: shall be field selectable from 0.5 to 5.0 Hz maximum per second.

5. Bypass Frequency Synchronization Range: shall be field selectable from 0.5 to 5.0 Hz maximum per second.

6. Voltage Distortion: 3 percent THD maximum into a 100 percent linear load, 7 percent THD maximum into a 100 percent non-linear load with crest factor ratio of 3:1.

7. Load Power Factor Range: 0.5 lagging to 1.

8. Output Power Rating: Rated kVA at 0.7 lagging power factor.

9. Overload Capability: >100 percent to 110 percent indefinitely, 111 percent to 150 percent for ten seconds, and 151 percent to 200 percent for 0.25 seconds. The load shall be transferred to bypass when one of the previous conditions are exceeded. >201 percent for minimum two cycles, then shut down of UPS. Immediate shutdown into a short circuit.

10. Voltage Transient Response: +/- 7 percent maximum for a load step, up to and including 100 percent of the UPS rating.

11. Transient Recovery Time: To within 1 percent of steady state output voltage within 96 milliseconds.

(e) *Batteries.*

1. Internal Battery: The battery shall consist of flame retardant, valve regulated, lead acid cells. The UPS shall be suitable for installation inside a computer room per requirements of UL Standard 1778.

2. Reserve Time: The UPS shall contain an internal battery system to provide a reserve time of five minutes at 100 percent load and 12.5 minutes at 50 percent load, with an equal number of power and battery modules fitted. The UPS shall include provisions to fit additional battery

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modules internally if space permits. The UPS shall also interface with an external battery cabinet.

3. Battery Recharge: The UPS shall include temperature-compensated battery charging. When equal number of power modules and battery modules are fitted the battery charger shall be

4. able to recharge the internal batteries from 10 percent charge to 90 percent charge in six hours at nominal input voltage and nominal ambient temperature.

(f) *Environmental Conditions.*

1. Ambient Temperature

   A. Operating: UPS 32° F to +104° F; battery 68° F to 77° F for optimum performance.

   B. Storage: UPS –4° F to +140° F; battery –4° F to 77° F for maximum 6 months.

2. Relative Humidity

   A. Operating: 5 percent to 95 percent non-condensing.

   B. Storage: 5 percent to 95 percent non-condensing.

3. Altitude

   A. Operating: To 10,000 feet. Derating/reduced operating temperature range shall be required for higher altitudes.

   B. Storage: To 30,000 feet.

4. Audible Noise - Noise generated by the UPS during normal operation shall not exceed 62 dBA measured at three feet from the surface of the UPS.

5. Electrostatic Discharge - The UPS shall be able to withstand a minimum 15 kV without damage and shall not affect the critical load.

(g) *User Documentation.*

The specified UPS system shall be supplied with two user's manuals. Manuals shall include installation drawings and instructions, a functional description of the equipment with block diagrams, safety precautions, illustrations, step by step operating procedures, and routine maintenance guidelines.

(h) *Quality Assurance*

The manufacturer shall have a minimum of thirty years of experience in the design, manufacture, and testing of solid-state UPS systems.

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(i) *Factory Testing.*

Before shipment, the manufacturer shall fully and completely test the system to assure compliance with the specification. These tests shall include operational discharge and recharge tests on the internal battery to guarantee rated performance. The UPS shall ship completely assembled with all modules installed. The manufacturer shall submit certified test reports showing the results of the factory testing for acceptance to be included with each shipping unit.

(j) *Fabrication.*

All materials and components making up the UPS shall be new, of current manufacture, and not in prior service except as required during factory testing. The UPS shall be constructed of replaceable subassemblies. All active electronic devices shall be solid-state.

1. Wiring: Wiring practices, materials, and coding shall be in accordance with the requirements of the National Electrical Code (NFPA 70).

2. Cabinet: The UPS unit shall be comprised of: power module, battery module, control module, and user interface module housed in a single free-standing enclosure that shall meet the requirements of IP20. The UPS system shall be designed such that the battery modules may be installed into all module bays in the cabinet and power modules into all module bays in the top half of the cabinet. The UPS cabinet shall be cleaned, primed, and painted with the manufacturer's standard color. Casters and leveling feet shall be provided.

(k) *Cooling.*

The UPS shall be cooled by forced air via internally mounted fans.

(l) *Input Converter.*

1. General: Incoming AC power shall be converted to a regulated DC output by the input converter for supplying DC power to the inverter. The input converter shall provide input power factor and input current distortion correction.

2. AC Input Current Limit: The input converter shall be provided with AC input overcurrent protection.

3. Input Protection: The UPS shall have built-in protection against undervoltage, overcurrent, and overvoltage conditions including low-energy surges introduced on the primary AC source and the bypass source. The UPS shall sustain input surges without damage per criteria listed in IEEE C62.41, Category A & B. The UPS cabinet shall contain an input breaker sized to supply full 20 kVA rated load and to recharge the battery at the same time.

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4. Battery Recharge: The UPS shall contain temperature-compensated battery charging. When an equal number of power modules and battery modules are installed the battery charger shall be able to recharge the internal batteries to 90 percent charge in six hours at nominal input voltage and nominal ambient temperature.

5. Charger Output Filter: The battery charger shall be a DC power supply.

(m) *Inverter.*

1. General: The inverter shall convert DC power from the input converter output, or the battery, into precise regulated sine wave AC power for supporting the critical AC load.

2. Overload: The inverter shall be capable of supplying current and voltage for overloads exceeding 100 percent and up to 200 percent of full load current. A visual indicator and audible alarm shall indicate overload operation. For greater currents and longer time duration, the inverter shall have electronic current-limiting protection. The inverter shall be self-protecting against all magnitudes of connected output overload. Inverter control logic shall sense and disconnect the inverter from the critical AC load without the requirement to clear protective fuses. The load shall be transferred to bypass when one of the above conditions is exceeded

3. Maximum Load Alarm: The user shall be able to set the alarm point to a value less than 100 percent rating such that the UPS will alarm before an overload condition or loss of redundancy is reached.

4. Output Frequency: The output frequency of the inverter shall be controlled by an oscillator. The oscillator shall hold the inverter output frequency to +/- 0.5 percent for steady state and transient conditions. The inverter shall track the bypass continuously if the bypass source maintains a frequency within the user-selected synchronization range. If the bypass source fails to remain within the selected range, the inverter shall revert to the internal oscillator.

5. Output Protection: The UPS inverter shall employ electronic current limiting.

6. Battery over Discharge Protection: The UPS control logic shall control the shutdown voltage set point. This point is dependent on the rate of discharge.

(n) *Display and Controls.*

1. General

   A. The front panel shall consist of multiple status LEDs, switches, and a four line by twenty character liquid crystal display (LCD) for additional alarm and configuration information. All mimic display light emitting diodes (LEDs) shall be green in color and shall indicate the following:

      (1) AC Input

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(2) On Battery

(3) Load On/Off

(4) On Inverter

(5) On Bypass

B. The UPS fault indicator shall be used with additional indicators listed below and audible alarms to notify the user that a UPS fault condition has occurred. The color of the fault indicator LED shall be amber.

(1) Replace Battery Module

(2) Replace Power Module

(3) Replace Control Module

(4) On Bypass

(5) Low Battery

(6) Over Temp Warning

(7) UPS Shutdown

C. If there is a fault condition, the UPS shall attempt to maintain conditioned power to the load or transfer to bypass. There shall also be a visual indication on each module that indicates if the module failed and needs to be replaced.

D. In addition to an audible/visual fault signal the UPS shall also record fault occurrences in a rolling event log. The event log on the standard unit shall record up to 255 occurrences, with the oldest events discarded first, etc. The user shall have access to the event log through the LCD display. Every alarm and event recorded in the event log shall contain a time and date stamp.

2. Audible Alarms

A. The volume of all audible alarms shall be at least 65 dBA at a distance of three feet. An audible alarm shall be used in conjunction with the LED/LCD indication to indicate a change in UPS status.

B. The audible alarms shall enunciate for utility line loss, low battery (while on battery), and all other alarm conditions. For all alarm conditions, the user will look at the display to determine the cause of error/alarm.

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C. All alarm tones shall be a continual tone until the condition rectifies itself or the alarm is silenced. Once silenced, the audible alarm shall not sound until a new alarm condition is present.

3. Alarm Silence Button: In addition to the load On/Off switch, the user interface shall include an audible 'Alarm Silence' switch. If the alarm silence switch is pressed for one second, all current audible alarms shall be disabled. If a new alarm occurs, or a cancelled alarm condition disappears and then re-appears, the audible alarm shall be re-enabled.

4. LCD Display: The display shall be capable of being used to program all information (voltage, frequency, etc.) into the UPS. All display values that require time and date shall be 'year 2000' compliant.

(o) *Automatic Battery Test.*

1. The UPS shall initiate an automatic battery testing sequence periodically, at a programmed day and time of day, selectable by the end user. The user shall be able to select the interval of the battery test and shall be able to select 1, 2, 3, 4, or 6 week intervals, and shall be able to select to disable the automatic battery test.

2. Should a battery failure occur, the battery module shall disconnect itself from the critical DC bus and the UPS shall immediately return to normal mode and fault signals (visual, audible, and remote via serial) shall be communicated. No audible or remote (via serial/contact closures) indication of the battery test shall be communicated during the duration of the automatic battery test.

3. The automatic battery test factory default settings shall be enabled at a two week interval and shall occur on Wednesdays at 0600 hours (based on the twenty-four hour clock).

(p) *Remote Emergency Power Off (REPO).*

1. The remote emergency power off function (REPO) shall allow the user to disable all UPS outputs in an emergency situation. The REPO shall be able to interface with either normally open (N.O.) or normally closed (N.C.) systems. The REPO shall be activated when a pair of Safety Extra Low Voltage (SELV) contacts, external to the UPS, are activated. The REPO connection shall be through a simple terminal block type connector.

2. The REPO function shall not operate if no system control modules are present in the UPS or if the manual bypass switch is in the bypass position. The user will supply a means of interfacing with the REPO circuit to allow disconnecting the UPS input feeder breaker to remove all sources of power to the UPS and the connected equipment to comply with local wiring codes/regulations.

3. Regardless of the UPS mode of operation when the REPO is activated, the UPS output shall not be re-enabled until the following occurs:

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A. REPO contacts are reset (closed if N.C. contacts are used and open if N.O. contacts are used)

B. Input circuit breaker is closed

C. Control enable switch is turned on

D. User interface on/off switch is depressed

(q) *Bypass.*

1. General: A bypass circuit shall be provided as an integral part of the UPS. The bypass shall have an overload rating of 300 percent rated full load for ten cycles and 1000 percent for sub-cycle fault clearing. The bypass control logic shall contain an automatic transfer control circuit that senses the status of the inverter logic signals and operating and alarm conditions. This control circuit shall provide a transfer of the load to the bypass source, without exceeding the transient limits specified herein, when an overload or malfunction occurs within the UPS.

2. Automatic Transfers

A. The transfer control logic shall automatically activate the bypass, and shall transfer the critical AC load to the bypass source, after the transfer logic senses one of the following conditions:

(1) Inverter overload capacity exceeded

(2) Inverter over temperature

(3) UPS fault condition

B. For inverter overload conditions, the transfer control logic shall inhibit an automatic transfer of the critical load to the bypass source if one of the following conditions exists:

(1) Inverter/Bypass voltage difference exceeding preset limits (±15 percent of nominal)

(2) Bypass frequency out of preset limits (± 5 percent of nominal frequency)

C. Automatic Retransfer: Retransfer of the critical AC load from the bypass source to the inverter output shall be automatically initiated unless inhibited by the manual control. The transfer control logic shall inhibit an automatic retransfer of the critical load to the inverter if one of the following conditions exists:

(1) Bypass out-of-synchronization range with inverter output

(2) Overload condition exists in excess of the inverter full load rating

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(3) UPS fault condition present

D. Manual Transfer

(1) The UPS shall have a manual bypass function. The manual bypass function shall be provided via a switch mounted on the bottom-front of the UPS. The AC break time between inverter and bypass shall be less than four milliseconds.

(2) The manual bypass shall be configured to wrap around the rectifier, battery charger, inverter, and battery in the same manner as the automatic bypass. The manual bypass shall not wrap around the electromagnetic interference (EMI) filtering, overcurrent protection or isolation transformer.

(3) The UPS shall initiate an audible alarm upon transfer to manual bypass. The audible alarm shall be capable of being silenced by the user. The alarm shall continue to sound (unless silenced) while in bypass mode..

(r) *Internal Battery.*

Flame retardant, valve regulated, gas recombination, lead acid batteries shall be used as a stored-energy source for the specified UPS system. The battery shall be housed in separate replaceable modules that slide into all open bays of the UPS cabinet, and shall be sized to support the inverter at rated load and power factor, in an ambient temperature between 68°F and 77° F, for five minutes of reserve time at 100 percent load, and 12.5 minutes of reserve time at 50 percent load. The expected life of the battery shall be five years or a minimum of 250 complete discharge cycles. For extended battery reserve time, additional battery modules may be added if the frame size allows; external battery cabinets shall be available as an option.

(s) *Communications.*

The UPS shall allow for flexibility in communications via two DB9 communication ports and four Ethernet ports on the rear of the UPS. The UPS shall be able to communicate through two communications ports simultaneously; the media of either communications port shall be able to change without affecting the operation of the UPS.

(t) *Network Communications.*

A communications interface card that provides HTTP supported SNMP communication over a local area network shall be furnished and installed, unless otherwise specified by the Engineer. This card shall support 10/100 megabits per second Ethernet over unshielded twisted pair connection.

CONSTRUCTION REQUIREMENTS

All cable and equipment shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the Contract Documents shall be

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TRAFFIC MANAGEMENT SYSTEM BUILDING UPS

subject to the control and approval of CDOT or CDOT's designated representative. Equipment and materials shall be of the quality and manufacture indicated.

The Contractor shall provide manufacturer's equipment data sheets, specifications and installation instructions for all products.

(a) *Equipment Labeling.*

Equipment labeling shall be provided for each UPS and shall include all critical information concerning the system to which it is affixed. This information shall include the following:

1. Equipment nomenclature and designation (e.g., UPS 1)
2. System capacity rating in kVA and kW (e.g., 20 kVA / 18 kW)
3. Input voltage, phasing, and connection (e.g., 480 V, 3-Phase, 3-Wire Input)
4. Output voltage, phasing, and connection (e.g., 120/208 V, 3-Phase, 4-Wire Output)
5. Frequency and power factor (e.g., 60 Hz, 0.9 PF Lagging)
6. System or switchboard serving this piece of equipment
7. System, switchboard, or load that is being served by this equipment

(b) *Field Quality Control.*

The following inspections and test procedures shall be performed by factory trained field service personnel during the UPS start-up.

1. Visual Inspection
   A. Inspect equipment for signs of shipping or installation damage.
   B. Verify installation per drawings.
   C. Inspect cabinets for foreign objects.
   D. Verify neutral and ground conductors are properly sized and configured.
2. Mechanical Inspection
   A. Check all power modules are correctly fitted.
   B. Check all battery modules are correctly fitted
   C. Check all terminal screws, nuts, and spade lugs for tightness.

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REVISION OF SECTION 614
TRAFFIC MANAGEMENT SYSTEM BUILDING UPS

3. Electrical Inspection

   A. Confirm input voltage and phase rotation is correct.

   B. Verify bypass voltage jumper is correct for voltages being used.

(c) *Unit Start-Up and Site Testing.*

The manufacturer's field service personnel shall provide site testing. Site testing shall consist of a complete test of the UPS system and the associated accessories supplied by the manufacturer. A partial battery discharge test shall be performed as part of the standard start-up procedure. The test results shall be documented, signed, and dated. Failure of one portion of the test shall require corrective action to that portion of the test and retesting of the entire system.

REVISION OF SECTION 614
HVAC

Section 614 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

This work consists of furnishing and installing heating, ventilation, and air conditioning (HVAC) units for Traffic Management System Buildings.

MATERIALS

The Contractor shall furnish and install a self-contained wall mount heating, ventilation, and air conditioning (HVAC) unit suitable for outdoor use that is fully compatible with installation in the traffic management system building. The unit shall be completely factory assembled and tested and shall include compressor, indoor and outdoor coils, fans and motors as required, pre-wired controls, interconnecting refrigerant tubing, wiring, disconnects, and other necessary components mounted in a corrosion resistant cabinet. The units shall be Underwriters Laboratories (UL) approved and Air-Conditioning, Heating, and Refrigeration Institute (AHRI) AHRI Standard 210 certified.

Each HVAC unit shall have a Seasonal Energy Efficiency Ratio/Energy Efficiency Ratio (SEER/EER) rating of 10 or higher at AHRI conditions of 20°C wet bulb, 25°C dry bulb entering indoor air, and condenser entering air temperature of 35°C dry bulb. The total net cooling minimum capacity of the individual units shall be 56,500 British Thermal Units per Hour (BTUH) or greater, and sensible capacity shall be 45,600 BTUH or greater at AHRI conditions stated above. Electric resistance heating of 10 kilowatts shall be provided integral to the units. The compressor shall be a hermetic-type unless otherwise Approved by the Engineer. The refrigeration circuit shall include high and low pressure switches with a lockout relay. The contacts of the lockout relay shall be used to represent air conditioner / heater failure and shall be connected to the alarm terminal blocks.

The condenser and evaporator coils shall be constructed of aluminum plate fins mechanically bonded to seamless copper tubes. Outdoor fans shall be direct driven, slow speed propeller type for quiet operation. An economizer shall be factory installed within the cabinet of the air conditioner / heater. Slip-in economizers are not acceptable. The economizer shall include an enthalpy sensor to control the damper by measuring the total heat content of the outside air.

Unless otherwise noted on the plans; provide 230-VAC, 1-Phase units for buildings with a 120/240-VAC, 1-Phase electrical service, 200-VAC, 3-Phase units for buildings with a 120/208-VAC, 3-Phase electrical service, and 460-VAC, 3-Phase units for buildings with a 277/480-VAC, 3-Phase electrical service.

The air conditioning system shall include a lead/lag controller with thermostat with temperature adjustments over a minimum range of 15°C to 35°C. The air conditioner / heater controller shall have a programmable, 7-day, 24-hour clock with battery backup selectable for automatic air conditioner / heater switch over. It shall be possible to activate both air conditioner / heaters to accelerate cooling of the Traffic Management System Building when the building has reached a high ambient temperature.

CONSTRUCTION REQUIREMENTS

Shop drawings shall be submitted for Approval.

All installation work shall be completed in a professional and workman like manner.

REVISION OF SECTION 614
TRAFFIC MANAGEMENT SYSTEM BUILDING GENERATOR

Section 614 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

The work shall include obtaining and installing a generator and all necessary conduit and wiring to connect the generator to the automatic transfer switch in the Traffic Management System Building. This work shall include all necessary conduits, wires, enclosures, equipment, materials, and personnel.

MATERIALS

The Contractor shall provide a generator with an environmental enclosure rated for installation in an exterior uncovered setting. The generator set shall be of the latest commercial design and shall include all of the necessary accessories for complete and operational installation as shown on the plans and in the specifications. The equipment supplied and installed shall meet the requirements of the National Electrical Code (NEC), along with all applicable local codes and regulations. All equipment shall be new and of current production of a national firm that manufactures the generator set and controls, transfer switches, switchgear, and assembles the generator set as a complete and coordinated system. There shall be one source of responsibility for warranty, parts, and service through a local representative with factory-trained service personnel.

(a) *Equipment.*

1. The generator shall be rated at not less than 60-kW/75-kVA at 120/208-VAC 3-Phase, and shall include an enclosed molded-case 250 Amp, 3-Pole output circuit breaker. The generator shall be capable of this rating while operating in an ambient condition of 90°F and 4800 feet above sea level.

2. Vibration isolators shall be provided between the engine-alternator and heavy-duty steel base.

3. The unit shall be supplied with all hardware to bolt the unit to a concrete slab.

(b) *Engine - The engine shall be equipped with the following:*

1. An electronic isochronous governor capable of +0.5 percent steady-state frequency regulation.

2. 12 Volt positive engagement solenoid shift-starting motor.

3. 70 Ampere minimum automatic battery charging alternator with solid-state voltage regulation.

4. Positive displacement, full pressure lubrication oil pump, cartridge oil filters, dipstick, and oil drain.

5. Dry-type replaceable air cleaner elements for normal applications.

6. The engine shall be fueled with natural gas and be supplied with a unit-mounted electric solenoid fuel shut-off valve, flexible fuel line, and secondary fuel pressure regulator.

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REVISION OF SECTION 614
TRAFFIC MANAGEMENT SYSTEM BUILDING GENERATOR

7. The engine shall have a minimum of eight cylinders, and be liquid-cooled by a unit-mounted radiator, blower fan, water pump, and thermostats. This system shall properly cool the engine with up to 0.5 inches water static pressure on the fan in an ambient temperature up to 122°F (50°C).

(c) *Alternator.*

1. The alternator shall be of a permanent magnet brushless design.

2. The alternator shall be salient-pole, brushless, 12-lead reconnectable, self-ventilated of drip-proof construction with amortisseur rotor windings and skewed stator for smooth voltage waveform. The insulation shall meet the NEMA MG1-2014 Part 33.4 for Class H and be insulated with epoxy varnish to be fungus resistant per NEMA RE 2-1999. Temperature rise of the rotor and stator shall be limited to 266°F (130°C). The excitation system shall be of brushless construction controlled by a solid-state voltage regulator capable of maintaining voltage within +/- 2 percent at all constant loads from 0 percent to 100 percent of rating. The regulator must be isolated to prevent tracking when connected to silicon-controlled rectifier (SCR) loads, and provide individual adjustments for voltage range, stability and volts-per-hertz operations, and be protected from the environment by conformal coating.

3. The generator set shall meet the transient performance requirements of ISO 8528-5, class G2.

4. The alternator excitation shall be of a permanent magnet exciter design.

5. The generator shall be inherently capable of sustaining at least 250 percent of rated current for at least ten seconds under a 3-phase symmetrical short circuit without the addition of separate current support devices.

6. The alternator having a single maintenance-free bearing, shall be directly connected to the flywheel housing with a semi-flexible coupling between the rotor and the flywheel.

(d) *Controller.*

1. Set-mounted controller capable of facing right, left, or rear, shall be vibration isolated on the alternator enclosure. The controller shall be capable of being remote-mounted. The microprocessor control board shall be moisture proof and capable of operation from -40°F (-40ºC) to 185°F (85ºC). Relays shall only be acceptable in high-current circuits.

2. Circuitry shall be of plug-in design for quick replacement. Controller shall be equipped to accept a plug-in device capable of allowing maintenance personnel to test controller performance without operating the engine.

3. The controller shall include the following features:

   A. Fused DC circuit.

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REVISION OF SECTION 614
TRAFFIC MANAGEMENT SYSTEM BUILDING GENERATOR

B. Speed sensing and a second independent starter motor disengagement systems shall protect against starter engagement with a moving flywheel. Battery charging alternator voltage shall not be acceptable for this purpose.
C. Complete 2-wire start/stop control, which shall operate on closure of a remote contact.
D. The starting system shall be designed for restarting in the event of a false engine start, by permitting the engine to completely stop and then re-engage the starter.
E. Cranking cycler with 15 second ON and OFF cranking periods.
F. Overcrank protection designed to open the cranking circuit after 75 seconds if the engine fails to start.
G. Circuitry to shut down the engine when signal for high coolant temperature, low oil pressure, or overspeed is received.
H. Engine cool down timer factory set at five minutes to permit unloaded running of the standby set after transfer of the load to normal.
I. 3-position (Automatic-OFF-TEST) selector switch. In the TEST position, the engine shall start and run regardless of the position of the remote starting contacts. In the Automatic position, the engine shall start when contacts in the remote control circuit close and stop five minutes after those contacts open. In the OFF position, the engine shall not start even though the remote start contacts close. This position shall also provide for immediate shutdown in case of an emergency. Reset of all faults shall also be accomplished by putting the switch to the OFF position.
J. Audible alarm with silencing means per NFPA 110.

4. Standard indicating lights to signal the following shall be included:

A. Not-in-Auto (flashing red)
B. Overcrank (red)
C. Emergency Stop (red)
D. High Engine Temperature (red)
E. Overspeed (red)
F. Low Oil Pressure (red)
G. Battery Charger Malfunction (red)
H. Low Battery Voltage (red)
I. Low Fuel (red)
J. Auxiliary Prealarm (yellow)
K. Auxiliary Fault (red)
L. System Ready (green)

5. Test button for indicating lights.

6. Terminals shall be provided for each indicating light above, plus additional terminals for common fault and common pre-alarm.

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REVISION OF SECTION 614
TRAFFIC MANAGEMENT SYSTEM BUILDING GENERATOR

(e) *Instrument Panel.*

The instrument panel shall include the following:

1. Dual range voltmeter 3 1/2 inch, +/- 2 percent accuracy
2. Dual range ammeter 3 1/2 inch, +/- 2 percent accuracy.
3. Voltmeter-ammeter phase selector switch.
4. Lights to indicate high or low meter scale.
5. Direct reading pointer-type frequency meter 3 1/2 inch, 0.5 percent accuracy, 45 to 65 hertz (Hz) scale.
6. Panel-illuminating lights.
7. Battery charging voltmeter.
8. Coolant temperature gauge.
9. Oil pressure gauge.
10. Running-time meter.
11. Voltage-adjust rheostat

(f) *Accessories.*

1. An 80 percent rated line circuit breaker of 250 amperes, 240 volt rated, molded case type, generator mounted. A resettable line current sensing circuit breaker with inverse time versus current response shall be furnished which protects the generator from damage due to its own high current capability. This breaker shall not trip within the ten seconds specified above to allow selective tripping of down-stream fuses or circuit breakers under a fault condition. This breaker shall not automatically reset, preventing restoration of voltage if maintenance is being performed. A field current-sensing breaker shall not be acceptable.
2. Engine block heater. Thermostatically controlled and sized to maintain manufacturers recommended engine coolant temperature to meet the start-up requirements of NFPA 110, Level 1.
3. Weather housings shall be constructed of rugged steel, cleaned, phosphated, and electrocoat painted inside and out with rust inhibiting primer and exterior coat of the manufacturer's standard color. Side panels shall be lockable and easily removed for servicing.
4. Battery rack, and battery cables, capable of holding the manufacturer's recommended batteries, shall be supplied.
5. 6 Ampere automatic float and equalize battery charger with +/- 1 percent constant voltage regulation from no load to full load over +/-10 percent.
6. AC input line variation, current limited during engine cranking and short circuit conditions, temperature compensated for ambient temperatures from -40°F (-40ºC) to +140°F (60ºC), 5 percent accurate voltmeter and ammeter, fused, reverse polarity and transient protected.
7. The engine exhaust silencer shall be coated to be temperature and rust resistance, rated for critical application. The silencer shall reduce total engine exhaust noise by 25-35 decibels (A).
8. Gas-proof, seamless, stainless steel, flexible exhaust bellows with threaded NPT connection.

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REVISION OF SECTION 614
TRAFFIC MANAGEMENT SYSTEM BUILDING GENERATOR

9. Two flexible fuel lines rated at a minimum of 257°F and 100 pounds per square inch ending in pipe thread.
10. Generator rodent guards.

The generator set shall conform to the requirements of the following codes and standards:

1. NFPA 70 – National Electrical Code. Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702.
2. NFPA 110 – Emergency and Standby Power Systems. The generator set shall meet all requirements for Level 1 systems. Level 1 prototype tests required by this standard shall have been performed on a complete and functional unit, component level type tests shall not substitute for this requirement.
3. UL 2200. The generator set shall be listed to UL 2200 or submit to an independent third party certification process to verify compliance as installed.

CONSTRUCTION REQUIREMENTS

The Contractor shall submit foundation and generator slab drawings and calculations for approval.

The generator shall be installed in accordance with the manufacturer's recommendations. It shall be leveled on the pad. It shall be bolted to the pad in accordance with manufacturer's recommendations.

A site test shall be performed by the manufacturer. An installation check, start-up, and Traffic Management System Building load test shall be performed by the generator manufacturer's local representative. The engineer, regular operators, and the maintenance staff shall be notified of the time and date of the site test five business days in advance of the tests. The tests shall include:

1. Fuel, lubricating oil, and antifreeze shall be checked for conformity to the manufacturer's recommendations, under the environmental conditions present and expected.
2. Accessories that normally function while the generator set is standing by shall be checked prior to cranking the engine. These shall include: block heaters, battery charger, alternator strip heaters, remote annunciator, etc.
3. Start-up under test mode to check for exhaust leaks, path of exhaust gases outside the shelter, cooling air flow, movement during starting and stopping, vibration during running, normal and emergency line-to-line voltage and frequency, and phase rotation.
4. Automatic start-up by means of simulated power outage to test remote-automatic starting, transfer of the load, and automatic shutdown. Prior to this test, all transfer switch timers shall be adjusted for proper system coordination. Engine coolant temperature, oil pressure, and battery charge level along with generator set voltage, amperes, and frequency shall be monitored throughout the test. An external load bank shall be connected to the system if sufficient Traffic Management System Building load is unavailable to load the generator set to the nameplate kilowatt rating.

REVISION OF SETION 614
ITS TEST LAB

Section 614 of the Standard Specifications is hereby revised for this project as follows:

DESCRIPTION

The Contractor shall set up an ITS test laboratory for testing ITS devices and shall provide all ITS equipment required for the test lab. This allows the CDOT's software developer (CTMS Integrator) to remotely operate and view devices, such as dynamic message signs (DMS) during the software development and testing phases for device(s). The Contractor shall provide devices and associated equipment from the manufacturers for software driver development, software testing and integration of the device into the CMTC and overall ITS system. The Contractor shall provide a secure location to house the ITS test lab equipment.

MATERIALS

The following device shall be furnished and fully functional, (with exception of integration) for the ITS test lab:

1. All types of variable message sign to be used on Project (including but not limited to DMS and SMVMS);

2. All CCTV cameras;

3. DSRC Radio; and

4. Three LUS signs. Signs shall be set up for concurrent testing.

The Contractor shall provide remote communications through a VPN access to the ITS test lab to allow for test message delivery to the device(s) from the CTMS Integrator.

The Contractor shall provide a web interface camera for the test lab to allow for the test lab devices to be remotely monitored and verify messages by the CTMS Integrator and the CTMC.

The Contractor will install and configure all devices in the test lab with the firmware that will be utilized with that device.

This test lab shall include all communications and power distribution assemblies, load centers, and cabling necessary to provide a wholly functional system.

Communications equipment will include, but is not limited to, an Ethernet switch and jumper cables. Communications shall be either on the Contractor's internal network, be placed on cellular modems, or provide other means of communication between the test lab and the CTMS Integrator's offsite testing location. All cabinets and controllers shall be provided as necessary.

CONSTRUCTION REQUIREMENTS

The Contractor shall work with the CTMS Integrator to configure and set up the test lab and devices. The Contractor shall provide an indoor facility where all ITS test lab equipment and devices, can be set up for

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REVISION OF SECTION 614
ITS TEST LAB

testing. Contractor will fully set up the devices and equipment, provide power and communications to allow for the CTMS Integrator to test integration of device.

CTMS Integrator will need to have access to the facility during business hours.

The Contractor shall provide all test lab devices and equipment, and provide the CTMS Integrator remote access to the fully functional ITS test lab nine months before devices are to be installed. The CTMS Integrator needs this time in the test lab to verify device compatibility prior to the large volume ordering and for software development prior to installation of devices. The Contractor shall work with the software developer and CTMS Integrator to configure the test lab and adjust devices for testing. This may require resetting placement and angles of signs to allow for visibility and operations from remote testing location by the CTMS Integrator. The ITS test lab shall remain operational through Final Acceptance.

REVISION OF SECTION 614
TOLL SYSTEM INTEGRATION

Section 614 of the Standard Specifications is hereby revised for this Project as follows:

DESCRIPTION

Subsection 614.01 shall include the following:

This work includes furnishing and installing infrastructure to support an electronic toll collection system to be provided by the ETC System Integrator under separate contract to CDOT / High Performance Tolling Enterprise (HTPE). Infrastructure is to be furnished and installed by the Contractor which includes: PVC conduit, electrical power, gantries, poles, foundations and cabinets as shown in the plan sheets and described in the Special Provisions. Supporting / coordinating activities include lane closures and traffic control as requested by the ETC Systems Integrator and approved according to applicable lane closure policies.

MATERIALS

Subsection 614.02 shall include the following:

All infrastructure components, lane closures, and traffic control shall comply with the individual specifications related to them within these Special Provisions.

CONSTRUCTION REQUIREMENTS

Subsection 614.09 shall include the following:

The System Integrator will be required to follow the applicable lane closure policy for traffic control for all equipment installation, configuration, integration, and testing activities on the facility. In addition, the System Integrator will be required to schedule all work activities with the Contractor and provide at least 48 hours' notice of any lane closures needed to do the work. If a lane closure cannot be accommodated the Contractor shall propose another time period that is conducive to their work schedule. Any delays to the Project due to scheduling this work are the responsibility of the Contractor.

The Contractor will provide and coordinate traffic control for the ETC System Integrator's activities during the requested and approved lane closure.

Due to long delays regarding equipment of this nature the Contractor can expect up to 6 months backlog from vendors to receive equipment for this work both by the ETC System Integrator and the Contractor and this should be taken into account in the work schedule. This work will include conduit, cabinets, wire, toll equipment, poles, attachments, AVI readers, backup systems, mounting brackets, fiber connectors, connection, etc.

REVISION OF SECTION 614
ITS AND CCD OFFLINE DEVICES

Section 614 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

Throughout the duration of the project, the Contractor is responsible for the maintenance of all ITS and CCD devices and communications infrastructure contained within the limits of this project.

Offline, as used in this specification, is defined as time during which data or video is not being received by a Colorado Operations Center or Node Building.

CONSTRUCTION REQUIREMENTS

The Contractor and the Department shall provide CDOT ITS (Jill Scott at office: 303.512.5805, jill.scott@state.co.us) and Region 1 Traffic Maintenance (Ben Kiene at office: 303.365.7307, benjamin.kiene@state.co.us) an advanced notice for all planned CDOT outages, and shall provide CCD an advance notice for all CCD devices as described below:

(a) *Planned ITS Outages.*

A "planned outage" is considered to be any loss of device functionality or communication that can be anticipated in advance due to work activities within or related to the Project. For planned outages, CDOT ITS or CCD shall be given proper advance notice as described below. All proposed equipment, power, and all temporary communications necessary for maintaining ITS devices during construction shall be constructed and put in place prior to the cutover or reset in order to minimize downtime of devices.

1. ITS Network: The Contractor shall submit a fiber optic backbone cutover plan to CDOT ITS or CCD for review 30 calendar days prior to disruption of communications or device outages, as well as a one week advance notice to CDOT ITS or CCD of any fiber optic backbone cutover work. This cutover plan shall detail how the Contractor will sequence the construction activities, so that the new backbone is installed and spliced into the existing devices and the node building such that 12-hours of downtime is not exceeded. CDOT's or CCD's network fibers shall be spliced first in the sequence. The fiber optic backbone splicing shall be scheduled for an overnight shift such that the ITS network shall be fully functional by 4 AM and the remaining cable is complete by 9 AM, unless otherwise Approved by the Engineer. The fiber optic backbone splicing shall be scheduled between Tuesday and Thursday, except holidays, unless otherwise Approved by the Engineer.

   For work on node locations, the Engineer shall be notified about the need to shut down power in order to perform electrical wiring work at least 48 hours before the power needs to be shut down. Additionally, the Engineer shall be notified the day before the shutdown and on the morning of the day of the shutdown. Power shall be turned off in a responsible manner that will not harm existing node components. All necessary precautions and preparations shall be made and coordinated with CDOT prior to power being turned off. Power may not be off for a period of longer than 45 minutes unless specifically authorized by the Engineer.

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REVISION OF SECTION 614
ITS AND CCD OFFLINE DEVICES

2. ITS Devices: The Contractor shall provide a 72-hour advance notice to CDOT ITS or CCD to coordinate any downtime for ITS devices for a planned outage. Allowable offline periods for ITS field devices shall be a 48-hour period scheduled between Tuesday and Thursday, excluding holidays, unless otherwise Approved by the Engineer. ITS field devices covered under this special provision include, but are not limited to, CDOT and CCD CCTVs, MVRDs, RWISs, TTIs, ramp meters, DMSs, dopplers, ATRs, and CCD traffic signals. No more than two ITS devices shall be inoperable at any one time.

   For locations with new poles, all work on the new pole including installation of the cabinet, power, pull boxes, and fiber optic cables shall be advanced to the greatest possible degree of completion before any part of the existing system is disturbed. When the existing system is disturbed at a one location, work at that location shall progress continuously until that new or reset installation is fully operational and connected to the CMTC.

   Installation of in-cabinet elements into new cabinets shall be done at locations where no construction traffic control is required.

(b) *Unplanned ITS Outages.*

An "unplanned outage" is considered to be any loss of network communications or device functionality that CDOT ITS or CCD does not receive proper advance notice, as described above, or is due to the Contractor's negligence, act or omission under their control.

1. ITS Network: If the Contractor damages the CDOT ITS or CCD fiber optic backbones, CDOT ITS or CCD lose communications or power to a node building or operations center as a result of the Contractor's negligence, act or omission under their control (e.g. Contractor damages ITS fiber optic backbone, disables the power to a node building/CTMC, or disables the communications between CMTC, node building and/or device), the Contractor shall be charged a disincentive. This disincentive is assessed per the requirements in Schedule 6 (*Performance Mechanism*) of this Project Agreement.

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REVISION OF SECTION 614
ITS AND CCD OFFLINE DEVICES

COLORADO DEPARTMENT OF TRANSPORTATION
TEMPORARY OFFLINE ITS DEVICE NOTIFICATION

Project Description / Location:	Project #:	Project Code (SA #):
Project Engineer:	Project Engineer Contact #:	Date:
Contractor:	Contractor Representative:	Contractor Rep Contact #:

Device Type (VMS, CCTV...)	Highway / Direction (NB I-25)	Mile Marker (241.69)	Description of Device Location (North of St. Vrain River, US-34 Interchange...)	Offline Date (10/26/15)	Estimated Down Time (48 Hours)	Online Date (10/29/15)

Contractor Notes:

Maintenance Notes:

CDOT Form # XXXX 6/15

REVISION OF SECTION 614
GROUNDING AND BONDING

Section 614 of the Standard Specifications is hereby revised for this project as follows:

DESCRIPTION

This work consists of grounding and bonding requirements at project locations for all Intelligent Transportation System (ITS) related structures, poles, service pedestals and cabinets. The work covered in this section consists of labor, materials, and services required for a functional and unobtrusive grounding system.

(a) *General*. Provide comprehensive grounding and bonding for ITS related equipment. CDOT's target resistance to ground value is equal to or less than 10 Ω.

(b) *Applicable Documents*. Work performed in this section shall comply with the most current edition of the following codes and standards:
1. IEEE 81 – Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System,
2. IEEE C2 – National Electrical Safety Code,
3. NEMA GR 1 – Grounding Rod Electrodes and Grounding Rod Electrode Couplings,
4. NFPA 70 – National Electrical Code,
5. NFPA 70E – Standard for Electrical Safety in the Workplace,
6. NFPA 780 – Standard for the Installation of Lightning Protection Systems,
7. TIA-607 – Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises,
8. UL 96 – Lightning Protection Components,
9. UL 96A – Installation Requirements for Lightning Protection Systems, and
10. UL 467 – Grounding and Bonding Equipment.

(c) Identify to the Engineer any conflicts between the requirements of codes/standards development organizations and the specifications for this project.

(d) *Submittals*.
1. Provide cut-sheets of each type of product proposed for approval by the Engineer prior to commencement of work.
2. Provide a system plan, conductor routing, supports, connectors and ground rods along with connection, mounting and splicing details.

MATERIALS

Components.
1. Grounding electrodes (driven rods): Provide ground rods that meet or exceed the following requirements:

   A. Preferred: Copper-clad steel ground rods (pointed) shall not be less than 0.625 inch diameter and a minimum of eight feet in length. It shall be UL certified and have a minimum plating thickness of 10 mil copper cladding.

   B. Other Alternatives: Other ground rod types, such as chemical ground electrodes, may be considered based on site soil chemistry, adjacent electrically bonded structures, or if the

installation must occur in a corrosive area. The Contractor shall obtain written permission from the Engineer prior to using the previously mentioned alternatives.

2. Grounding Electrode Conductor: The grounding electrode conductor shall be solid or stranded copper with a minimum size of #6 AWG, unless otherwise specified. The Contractor shall size the grounding electrode conductor in accordance with Article 250.66 of the NEC. Bare and insulated grounding electrode conductors shall be permitted, as Approved by the Engineer. Insulated grounding electrode conductors shall be Type THWN and conform to the requirements of Article 310 of the NEC. Insulated grounding electrode conductors shall utilize a green jacket color. The grounding electrode conductor run shall be installed in one continuous run without a splice or joint, except as permitted in accordance with Article 250.64(C) of the NEC.

   A. For bonding between a cabinet frame and busbar, a braided ground strap shall be utilized. The braided ground strap shall consist of non-insulated tinned copper flat braid wire with a minimum width of 0.5 inches and a thickness of 0.07 inches (based on estimated #6 AWG equivalence).

3. Grounding Connectors: Grounding connectors shall be provided for attachment to grounding electrodes, ground bus and ground lugs. Grounding and bonding connections shall be made by means of a compression connector, a mechanical connector, or an exothermic weld. Mechanical and compression connectors shall have only one conductor installed unless designed or UL-listed for more conductors. Mechanical connections shall only be permitted when a compression or exothermic connection cannot be made.

4. Ground Bus: Provide copper bar stock grounding busbar. The minimum size shall be 0.25 inch thick by 2 inches high by 6 inches wide and positions for five lugs, unless otherwise specified by the Engineer. Hole patterns on the busbar shall accommodate two-hole lugs in accordance with TIA-607 and hole spacing should not be less than 0.75 inch. Busbar must be wall mountable and UL certified. Stand-off brackets shall also be included and brackets shall be manufactured from 300 series stainless steel with stainless steel bolts and lock washers.

CONSTRUCTION REQUIREMENTS

General: Install equipment, materials and devices in accordance with equipment manufacturer's written instructions and in compliance with applicable installation standards.

1. Connections:

   A. Provide exothermically welded connections below grade and in areas exposed to visible moisture.

   B. Provide heavy duty bolted clamped connections, UL listed, above grade and in areas where safety to personnel and structures dictate.

2. Installation:

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REVISION OF SECTION 614
GROUNDING AND BONDING

A. Install one grounding electrode. Each grounding electrode shall be installed such that at least the entire length is in contact with the soil. Where a rock bottom is encountered, the grounding electrode installation shall conform to the requirements of Article 250.53(G) of the NEC. The grounding electrode system shall be installed within CDOT right-of-way.

B. Leave top of grounding electrode exposed for testing and for verifying quantities.

C. Measure the resistance of the installed grounding electrode with respect to the surrounding soil using an earth ground resistance tester.

D. If the results exceed 10 Ω, install a second grounding electrode a minimum of one electrode length away from the first grounding electrode. The bonding jumper used to connect grounding electrodes shall be installed and sized in accordance with Article 250.53(C) of the NEC.

E. Measure the resistance of the installed grounding electrode system with respect to the surrounding soil using an earth ground resistance tester.

F. Record and report results to Engineer in writing. CDOT's target resistance to ground is equal to or less than 10 Ω, however after installing two grounding electrodes, a resistance to ground value equal to or less than 25 Ω will be accepted by CDOT. The Contractor shall be responsible for confirming the resistance to ground requirements with the various manufacturers of the equipment it procures for this project. Where manufacturers have more stringent resistance to ground requirements for operational performance and warranties, the Contractor shall be required to adhere to the manufacturer's requirements for acceptance by CDOT.

G. In the absence of low resistance soil conditions, the Engineer, at his/her sole discretion, may allow the use of the following: bentonite to fill the ground rod hole; chemical electrodes; or ground enhancement material. The Contractor shall obtain written permission from the Engineer prior to using the previously mentioned materials.

3. Surface Preparation

A. Ground Bus: An abrasive pad shall be used to remove any dirt, grease, oil and oxidation from the ground bus. A thin coating of antioxidant compound shall be applied to the connection point on the ground bus. Using stainless steel hardware, the Contractor shall tighten and torque to the value specified for the hardware grade, material and size. Only one lug shall be installed per a two-hole mounting on a bonding surface. Lugs shall not overlap or use the same mounting holes on a bonding surface. Due to thermal cycling anticipated in the field environment, the lock washer shall be substituted with flat washers and a cupped spring washer (i.e., Belleville washer), with the cup against the head of the bolt.

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REVISION OF SECTION 614
GROUNDING AND BONDING

B. Other Surfaces: Clean the surface thoroughly where the grounding lug is to be connected. The grounding surface shall be clean of any paint, dirt, grease, oil, rust and other oxidation. A thin coating of antioxidant compound shall be applied to the connection point on the surface. Using stainless steel or silicon bronze hardware, the Contractor shall tighten and torque to the value specified for the hardware material and size. Lugs shall not overlap or use the same mounting holes on a bonding surface. The lock washer shall be substituted with flat washers and a cupped spring washer, with the cup against the head of the bolt.

C. Ground Attachment to Structures and Poles: The grounding electrode conductor shall be connected to the ground stud on a structure or within a pole using stainless steel nuts and cupped spring washers. The connector type for the grounding electrode conductor shall be a full circle connector sized appropriately for the diameter of the ground stud and the wire gauge of the conductor.

Where a ground stud does not exist on a structure or within a pole, the Contractor shall install a tapped and threaded hole to accommodate the grounding electrode conductor and screw. The connector type for the grounding electrode conductor shall be a full circle connector sized appropriately for the diameter of the screw and the wire gauge of the conductor. Stainless steel screws and cupped spring washers shall be included.

D. Grounding Connectors: The lug size, configuration and material for compression connectors shall be selected based on the grounding electrode conductor size and fastening conditions. The insulation shall be trimmed back so that the bared grounding electrode conductor is slightly longer than the barrel. After applying an antioxidant compound on the exposed grounding electrode conductor, insert the conductor so that it touches the end of the barrel as viewed through the inspection port. Ensure the grounding electrode conductor remains at the end of the barrel before making the first crimp nearest the tongue end and working toward the conductor with the remaining crimps. The lug manufacturer's instructions shall be followed for the number of crimps and their location on the barrel.

For exothermic welds to the grounding electrode conductor, select the mold and weld metal applicable to the conductor size and lug configuration. Clean and dry (using a torch) the grounding electrode conductor and the mold. Insert the conductor and lug into the mold. Close the handle clamp, lock the mold and then insert the disk into the mold. Pour the weld metal into the mold and apply the starting material over the weld metal and on the lip of the mold. Close the cover and ignite using a flint igniter. After the reaction is complete, wait a minimum of 15 seconds and then open the mold and remove the finished lug connection. Clean any slag from the finished lug connection.

See project specific Testing & Integration Plan for additional requirements.

REVISION OF SECTION 614
GLOBAL POSITIONING SYSTEM (GPS)

Section 614 of the Standard Specifications is hereby revised for this Project to include the following:

DESCRIPTION

The Contractor shall provide Global Positioning System (GPS) Coordinate information for all device, conduit, pull box and manhole locations on this Project. Coordinates of both proposed and existing devices in the project limits shall be provided. GPS coordinates shall be provided in both hard copy and electronic shape file formats.

MATERIALS

Documentation verifying the type of GPS unit being proposed for use and the specifications of the unit shall be provided to the Department for review prior to data gathering.

CONSTRUCTION REQUIREMENTS

The Contractor shall provide geodetic datum for all roadway devices, conduit, fiber optic pull boxes and manholes within the project limits. This shall include Intelligent Transportation System devices, communications cabinets, traffic signal controller cabinets, ramp metering cabinets, automated traffic recorder cabinets, conduit, pull boxes and fiber optic cable running line manholes.

The Contractor shall use a device designed specifically for mapping GPS information to Universal Transverse Mercator (UTM) Zone 13 coordinate system utilizing 1983 North American Datum (NAD83). Cell phones with GPS capabilities shall not be allowed for determining GPS location.

The GPS data shall be expressed in Latitude and Longitude and Universal Transverse Mercator (UTM) Zone 13 utilizing 1983 North American Datum (NAD83). Altitude shall be expresses in meters:

Latitude and Longitude shall be provided in Decimal Degree (DD) format to a precision of six decimal places.

Example - Latitude: _____ Longitude _____ Altitude (m) _____

North American Datum shall be provided in coordinates to a precision of three decimal places.

Example - X (easting) _____ Y (northing) _____ Z (m) _____

For data collection, the Contractor shall use the averaged waypoint. Minimum averaging time at each location shall be two minutes prior to documenting the information.

Accuracy tolerances for data collected by the GPS unit shall be within a maximum of 1 meter.

The Contractor shall completely fill in all information on the forms provided with Revision of Section 614 – ITS As-Built Documentation for submittal to the Department.

The Contractor shall provide electronic shapefiles with the GPS information for CDOT to import into their software. The mandatory file extensions needed for the shapefiles include .shp, .shx, .dbf, and .prj. The following shapefile attributes shall be collected by the Contractor:

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REVISION OF SECTION 614
GLOBAL POSITIONING SYSTEM (GPS)

A. Fiber Cables
   (1) Cable size and type
   (1) Depth of cable (in inches)
   (2) Owner
   (3) Cable manufacturer
   (4) Cable length
   (5) Device connected to (if fiber lateral)
   (6) Optical wavelengths to each communication device at the port level
   (7) Patch panel size, type, manufacturer, and position for each fiber

B. Power Cables
   (1) Number and size of conductors
   (2) Depth of cable (in inches)
   (3) Owner
   (4) Cable length

C. Communication Device
   (1) Type
   (2) Manufacturer
   (3) Configuration
   (4) Ports: type and status: active or unused.
   (5) Fiber strand corresponding to each active port
   (6) Port wavelength

D. Fiber/Power Structure (Pull Box / Manhole)
   (1) Location ID
   (2) Direction and number of empty and used conduits
   (3) Structure type – manhole or pull box
   (4) Manufacturer
   (5) Size – diameter of manhole or dimensions of pull box
   (6) Fiber Slack Loop – total length of slack loop in the units reported on the cable
   (7) Fiber Slack Storage Type – note if it is inside a manhole or pull box and if it is connected to a splice canister. Is it a coil or figure eight?
   (8) Hazardous – is the structure hazardous? If so, why? Examples of hazardous structures include confined spaces, atmospheric, concerns, falls from heights due to slip, trips or falls, or manholes over 5’ deep.

E. Splice Enclosure
   (1) Splice enclosure type
   (2) Splice enclosure manufacturer
   (3) Owner
   (4) Installer
   (5) Date installed
   (6) Location type
   (7) Location description
   (8) Grounding method
   (9) Site-specific comments

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REVISION OF SECTION 614
GLOBAL POSITIONING SYSTEM (GPS)

F. Electronic Marker
   (1) Marker Type
   (2) Marker Manufacturer
   (3) Marker Color and Frequency

G. Conduit System
   (1) Buried Depth
   (2) Encasement type
   (3) Manufacturer
   (4) Measured length
   (5) Installation date
   (6) Duct bank height
   (7) Duct bank width
   (8) Material
   (9) Construction status
   (10) Duct availability

H. ITS Device Point
   (1) Device Type – CCTV, TTI, DMS, MVRD, etc.

I. Power Structure (Meter/Disconnect)
   (1) Type – power meter or disconnect
   (2) Capacity / Breaker sizes

REVISION OF SECTION 614
ITS SYSTEM AS-BUILT DOCUMENTATION

Section 614 of the Standard Specifications is hereby revised for this Project to include the following:

DESCRIPTION

The Contractor shall complete and transmit to the Department the ITS as-built documentation as part of the final submittals on the Project.

MATERIALS

There are no materials requirements associated with this special provision.

CONSTRUCTION REQUIREMENTS

The Contractor shall document the as-built device, communications, and power infrastructure placement and material information. The Contractor shall clearly mark the plan sheets with red ink describing the as-built condition of all elements installed, including all changes made to fiber optic splicing. The as-built markups shall include the following information related to location markers:

(1) Type of location marker installed

(2) Distances between location markers

(3) Distances between pull boxes and manholes to ITS devices

(4) The distance and location to each CDOT utility point of service connection source point which the local utility companies have provided, including electrical power, transformer source, and telephone pedestals.

At the end of the Project, the Contractor shall create a legible PDF scan of the marked up as-built drawings, and submit the hard copy and PDF to the Department.

The Contractor shall complete the following forms included in this special provision:

(1) Form 1411—ITS Device Installation Checklist

(2) ITS As-Built Documentation Form

(3) Fiber Optic Cable As-Built Documentation Form

Prior to filling out forms, the Contractor shall review the forms and instructions and request all necessary clarification from the Department. Instructions for Form 1411 are included in this special provision.

The Contractor shall request from the Department electronic copies of the ITS As-Built Documentation Form and the Fiber Optic Cable As-Built Documentation Form. The Contractor shall fill out the electronic forms and provide the completed forms to the Department. The file name of the electronic forms shall include the form type, the five-digit construction subaccount number, and a description of the installation location.

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REVISION OF SECTION 614
ITS SYSTEM AS-BUILT DOCUMENTATION

FORM 1411

https://www.codot.gov/library/forms/cdot-1411

COLORADO DEPARTMENT OF TRANSPORTATION

ITS DEVICE INSTALLATION CHECKLIST (one form per device)

Project Engineer:	Installer:	Installation Date:
Engineer Contact #:	Installer Contact #:	

Device Type: ☐ CCTV ☐ VMS ☐ RWIS ☐ TTI ☐ Radar ☐ ATR ☐ Other: _____

Location: Roadway:_____ (Example: I-70) Direction:_____ (E) Crossroad:_____ (Wadsworth) Mile Marker:_____ (181.6)

Latitude:_____ (Example: 39.46532) Longitude: _____ (-104.3621) Altitude (in meters): _____

Manufacturer:	Model #:
Warranty Start:	Warranty Expiration Date:

Warranty Contact Information: _____ (Example: Vendor/Phone Contact)

Maintenance Responsibility: ☐ ITS ☐ Region _____ ☐ HLT ☐ EJT

IF REGION: ☐ Maintenance ☐ Traffic

Travel Time to Device from Golden, CO (To/From): _____ minutes

Equipment Access:_____ (Example: Bucket Truck, Ladder, Ground Level)

Roadway Closure Requirements for Maintenance:_____ (Example: Shoulder, Lane, Not Applicable)

Communications: ☐ Fiber ☐ Radio ☐ CDWH ☐ CDMA ☐ T1 ☐ Dial-Up ☐ Other: _____

Additional Communication Notes:_____ (Example: Phone#, MAC Address, etc.)

Device Purpose: ☐ Regulatory ☐ Safety ☐ Mobility ☐ Data Support ☐ System Support

Pictures: ☐ Inside of Cabinet ☐ From Traveling Direction ☐ From Opposite Travel Direction
☐ Any Physical Conditions That Could Affect Maintenance

Power Provider:	Contact:	Account:
Comm Provider:	Contact:	Account:

☐ Provide Redline as builts set of where Comm and Power Source from device back to provider to ITS Maintenance
(Contact Matt Rickard (303) 512-5634 with ITS Maintenance, with 3 weeks notice, for Acceptance when both Power and Comms are complete)

Additional Notes:

CDOT Form #1411 8/12

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REVISION OF SECTION 614
ITS SYSTEM AS-BUILT DOCUMENTATION

FORM 1411 INSTRUCTIONS

The following instructions are provided for information to the Contractor. The Contractor shall direct all questions regarding form 1411 to the CDOT ITS Engineer.

Project Engineer / Installer / Contact # / Installation Date

Fill in the name (first, last) of the Project Engineer and device Installer and phone numbers for both parties. Fill in the date of installation.

Device Type

Place a check next to the type of device being installed, or fill in the box marked "Other."

Location / Roadway / Direction / Crossroad / Mile Marker

Fill in the name of the major roadway on which the device is installed, the direction of travel on the side of road on which the device is installed, the nearest crossroad, and highway mile marker to the nearest hundredth of a mile. For the direction of travel, odd numbered highways are always considered north-south highways and even numbered highways are always considered east-west highways.

Latitude / Longitude / Altitude

Fill in the latitude, longitude, and altitude using the method described and the precision and accuracy defined in the special provision Revision of Section 614 – Global Positioning System (GPS).

Manufacturer / Model # / Warranty Start / Warranty Expiration Date / Warranty Contact Information

Fill in the manufacturer name, device model number, manufacturer warranty state date, warranty expiration date, and warranty contact information. The warranty contact information shall be the name and telephone number of the party responsible for addressing warranty issues with the device.

Maintenance Responsibility

With input from the Department, check the applicable box to identify the CDOT personnel responsible for maintaining the device. If a specific CDOT region is responsible, define whether region maintenance or traffic group is responsible for maintenance.

Travel Time to Device from Golden, CO

Use a reliable mapping tool to provide an approximate travel time in minutes (assuming no traffic) from 425 Corporate Circle, Golden, Colorado, 80401 to the device location. Google maps, Apple maps, and Bing maps are examples of reliable mapping tools.

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REVISION OF SECTION 614
ITS SYSTEM AS-BUILT DOCUMENTATION

FORM 1411 INSTRUCTIONS (CONTINUED)

Equipment Access

Briefly describe how maintenance personnel will access both the communications cabinet and device. If the communications cabinet is at ground level and the device requires a bucket truck for access, write "Cabinet ground level, device bucket truck" or something similar.

Roadway Closure Requirements for Maintenance

Describe what portion of the paved roadway is required to be occupied by a maintenance vehicle to access the communication cabinet and device.

Communications / Additional Communication Notes

Check the appropriate box for the type of communications used for the device, or fill in the box marked "Other." Provide additional applicable communications notes.

Device Purpose

With input from the Department, check the applicable box to identify the purpose of the device.

Pictures

Check that each described picture (at a minimum) has been taken and provided in a digital format to the Department. Label each picture file with the major street name, mile marker to the nearest hundredth, device type, and brief description of the picture (e.g. cabinet).

Power Provider / Contact / Account

Insert the name of the power service provider, power company contact phone number, and account number for the device service. If no new power service was provided for the device, fill in "NA"

Comm. Provider / Contact / Account

Insert the name of the communications service provider, communications service contact phone number, and account number for the device service. If communications is via CDOT's network, fill in "CDOT".

Provide redline as-builts

Check the box after redline as-builts of power and communications service points are provided as described.

Additional Notes

Fill in additional notes that are relevant to future maintenance operations.

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REVISION OF SECTION 614
ITS SYSTEM AS-BUILT DOCUMENTATION

COLORADO DEPARTMENT OF TRANSPORTATION

ITS AS-BUILT DOCUMENTATION FORM

Project Engineer:	**Installer:**	**Installation Date:**
Engineer Contact #:	**Installer Contact #:**	

Fiber					
Cable Size:		**Cable Type:**		**Owner:**	
Cable Manufacturer:		**Cable Length:**			
Fiber Marker Sequential Between Devices:					
Optical Wavelengths to Each Communication Device at the Port Level:					
Patch Panel Size:		**Patch Panel Type:**		**Port Status (Active/Unused):**	
Patch Panel Manufacturer:		**Patch Position (for each fiber):**			
Communication Device					
Type:		**Manufacturer:**			
Configuration:		**Port Type:**			
Fiber Strand Corresponding to Each Active Port:					
Port Wavelength:					
Splice Enclosure					
Splice Enclosure Type:		**Splice Enclosure Manufacturer:**			
Owner:	**Installer:**	**Date Installed:**		**Location Type:**	
Location Description:		**Grounding Method:**			
Site-Specific Comments:					
Electronic Marker					
Marker Type:		**Marker Manufacturer:**			
Marker Color:		**Marker Frequency:**			
Conduit System					
Buried Depth:		**Encasement Type:**			
Manufacturer:		**Model:**		**Measured Length:**	
Length Source:		**Duct Bank Height:**		**Duct Bank Width:**	
Installation Date:		**Material:**		**Construction Status:**	
Duct Availabilty:					

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REVISION OF SECTION 614
ITS SYSTEM AS-BUILT DOCUMENTATION

FIBER OPTIC CABLE AS-BUILT DOCUMENTATION FORM

COLORADO DEPARTMENT OF TRANSPORTATION

FIBER OPTIC CABLE AS-BUILT DOCUMENTATION FORM

TO NEXT PULL BOX OR MANHOLE

CABLE MEASUREMENT OUT:

PULL BOX OR MANHOLE ID:

MAJOR STREET OR HIGHWAY:

CABLE ID NUMBER:

CABLE MEASURMENT IN:

SPLICE POINT YES ☐ NO ☐
CABLE END SPLICE YES ☐ NO ☐
NUMBER OF LATERAL CABLES:

CABLE MEASUREMENT OUT:

PULL BOX OR MANHOLE ID:

MAJOR STREET OR HIGHWAY:

CABLE ID NUMBER:

CABLE MEASURMENT IN:

SPLICE POINT YES ☐ NO ☐
CABLE END SPLICE YES ☐ NO ☐
NUMBER OF LATERAL CABLES:

CABLE MEASUREMENT OUT:

PULL BOX OR MANHOLE ID:

MAJOR STREET OR HIGHWAY:

CABLE ID NUMBER:

CABLE MEASURMENT IN:

SPLICE POINT YES ☐ NO ☐
CABLE END SPLICE YES ☐ NO ☐
NUMBER OF LATERAL CABLES:

TO NEXT PULL BOX OR MANHOLE

Page:

Appendix B
Responsibility Matrix

Responsibility	Developer				ETC System Integrator			Zayo			CDOT			CCD
	Design	Construct	Maintain Through Two Year Period After Final Acceptance	Maintain During Remainder of Operating Period	Design	Construct	Maintain During Operating Period	Design	Construct	Maintain During Operating Period	Design	Construct	Maintain After Two-Year Period After Final Acceptance	Maintain After Final Acceptance
Conduit Duct Bank and Fiber														
Conduit-next to I-70	X	X	X (includes CDOT's new, ETC, and CDOT's existing)							X			X	X
Fiber Shared Resource– Zayo Per Schedule 10 Section 3 Zayo and Developer Responsibilities	X	X								X				
Fiber Backbone – CDOT Per Schedule 10 Section 3 Zayo and Developer Responsibilities	X	X	X										X	
Fiber Backbone – CCD Per Schedule 10 Section 3 Zayo and Developer Responsibilities	X	X												X
Fiber/Conduit Laterals CDOT	X	X	X										X	
Fiber/Conduit Laterals ETC	X	X	X										X	
Fiber/Conduit Laterals CCD	X	X												X
Utility Service														
Power service including service to all ITS and ETC devices and cabinet	X	X	X										X	
Establish meter service to all ITS and ETC devices	X	X											X	
Airport Node Building and ITS Devices including Dynamic Message Signs, Closed Circuit Television Cameras, Travel Time Indicators, DTD ATR's, Doppler Radar, RWIS, Friction Sensors, LUS, SMVMS, DSRC, Ramp Metering, MVRD, UPS, Ethernet Switches and Communication Equipment														
Existing Devices			X										X	
New Node Building and ITS Devices	X	X	X										X	
Coordinate with CTMC	X	X	X										X	
Modifications to CTMC's software											X		X	
Integrate devices into CTMS												X	X	
ITS Civil Infrastructure														
ITS sign structures, poles, cabinets and foundations, manholes, pull boxes	X	X	X	X										
ETC Devices														
VTMS system and associated equipment	X	X	X										X	
Integrate VTMS into CTMS operating system											X	X	X	
AVI antennas and readers	X					X	X						X	
ALPR cameras and loop detector wire	X					X	X						X	
Integrate ETC Devices into ETC System					X	X	X							
Electronic tolling lane controller	X					X	X						X	
Transaction status indicator Beacons	X					X	X						X	
UPS Equipment	X	X	X										X	

Responsibility	Developer				ETC System Integrator			Zayo			CDOT			CCD
	Design	Construct	Maintain Through Two Year Period After Final Acceptance	Maintain During Remainder of Operating Period	Design	Construct	Maintain During Operating Period	Design	Construct	Maintain During Operating Period	Design	Construct	Maintain After Two-Year Period After Final Acceptance	Maintain After Final Acceptance
ETC Equipment in cabinet	X					X	X						X	
ETC Civil Infrastructure														
ETC lane controller cabinet and foundation, cabling, patch panels, terminations, ALPR camera poles and bases, ETC structures, equipment attachments and hardware and miscellaneous hardware at tolling points	X	X	X	X										
UPS Cabinet	X	X	X	X										

4. UTILITIES

4.1. General

4.1.1. This Section provides information on the Developer's, the Department's, and Utility Owners' roles and responsibilities associated with any existing or new Utility that is located or planned to be located within the Site, and any Service Line or Utility service in respect of any such Utility, including but not limited to how a Utility is to be protected, adjusted, upgraded, constructed, or incorporated into the Project.

4.1.2. Utility Work is necessary to accommodate the Project for the following reasons:

a. Utility avoidance;

b. The Utility Relocations;

c. Any Utility Betterment; or

d. Any Requested Relocation.

4.1.3. In the Agreement (including this Section 4):

a. "CenturyLink URA" means the URA between CDOT and Qwest Corporation d/b/a CenturyLink QC;

b. "Sprint" means Sprint Communications Company, L.P.;

c. "Sprint Reimbursement Agreement" means an agreement required to be negotiated by the Developer with Sprint and subsequently entered into between the Developer and Sprint pursuant to Section 4.6.1.b of this Schedule 10;

d. "Sprint Work Order" means a work order executed by CDOT and the Developer in relation to any Utility Relocation of a Utility owned by Sprint, as contemplated by Section 4.2.9.d of this Schedule 10 and substantially in the form provided in Appendix B of this Section 4 (attaching a copy of the applicable Sprint Reimbursement Agreement).

4.1.4. For purposes of the Agreement (including this Section 4), wherever any of the following terms is used in relation to any Utility owned by Sprint, Sprint as a Utility Owner or Utility Work in respect of any Utility owned by Sprint:

a. any reference to a URA shall be deemed to mean the applicable Sprint Reimbursement Agreement;

b. any reference to a Utility Work Order shall be deemed to mean a Sprint Work Order;

c. any reference to Incidental Utility Work, Protection in Place, Utility Betterment or Utility Relocation shall be deemed to have the same meaning as, respectively, "Incidental Utility Work", "Protection in Place", "Betterment" and "Relocation" in the CenturyLink URA as applied to Sprint, the relevant Utility owned by Sprint and/or any relevant Sprint Work Order, as the context may require;

d. any reference to a Requested Relocation shall be deemed to include any Utility Relocation that Sprint requests be performed by the Developer; and

e. any reference to Utility Relocation Standards shall mean the standards specified in the applicable Sprint Reimbursement Agreement

4.2. Utility Work Obligations

4.2.1. The Developer shall either execute a Utility No-Conflict Closeout Form or execute a Utility Work Order for every Utility located within the Site (excluding any Temporary Property that is not a Temporary Easement). The Developer shall develop procedures for addressing Utility Work during design and construction, in accordance with Schedule 8 Project Administration.

4.2.2. The Construction Work will affect both existing and planned Utilities. The Department has coordinated with Utility Owners to provide the preparation of various preliminary planning, design,

and schedule activities for the Utilities potentially impacted by the Project. The Utility Owners' preliminary planning, design and schedule (between Brighton Boulevard and Colorado Boulevard) to perform the Utility Owners' Utility Relocations is based on the design of the Project, as provided in the Reference Documents.

4.2.3. The Developer shall coordinate and cooperate with the Department and the Utility Owners to ensure that all Utility Relocations and all Utility Work (whether performed or furnished, respectively, by a Utility Owner or by the Developer) is performed in accordance and in compliance with the applicable URA and Utility Work Order. The physical limits of the Developer's obligation for the performance of Utility Work shall extend as far as is necessary to accommodate a Utility Relocation (taking into account the requirements of the Utility Owners, Governmental Authorities, and adjacent property owners).

4.2.4. The Developer shall use Reasonable Efforts to anticipate and avoid Utilities, and to otherwise minimize and/or mitigate the consequences of Utility Work.

4.2.5. The Department anticipates that the review and Permit fee process set out in Section 4 of the Denver IGA shall apply with respect to the performance of the Utility Work by the Developer, provided that (for certainty and as contemplated by Exhibit B to the Denver IGA), the Developer shall be responsible for all fees associated with coordinating and processing to completion all necessary submittals to Denver Water City Sales Department and Denver sewer tap fees.

4.2.6. The Developer shall be responsible for performing all Utility Work in accordance with the requirements of the URAs, this Section 4, and other relevant provisions of the Agreement.

4.2.7. The Developer shall prepare permanent and temporary electrical designs for the Construction Work, which shall include the electrical and power requirements for the lighting, Intelligent Transportation Systems (ITS), the ETC system, traffic signals, landscaping, Cover (including Planning Area 1 and Planning Area 2), Cover MEP System, pump stations, and all other electrical devices that, in each case, form part of the Construction Work.

4.2.8. Utility Services

a. Developer shall be responsible for all costs of Utility services, including costs for power, communications, natural gas, and water service associated with the Work and the Developer's operations such as maintenance facilities, office facilities, or other similar facilities under Developer's control necessary for the Work unless otherwise specified in Appendix E Utility Service Matrix to this Section 4.

b. Department shall be responsible for system development charges from Denver Water Department to establish Utility services related to Construction Work.

c. Developer shall be responsible for Denver Water Department tapping labor, brass meter and inspection fees as defined in Denver Water Department Sales Administration by Denver Water Department to establish Utility services related to Construction Work.

d. The Developer shall perform all Utility Work necessary to maintain existing or establish new Utility services for lighting, ITS, the ETC system, traffic signals, landscaping, Cover (including Planning Area 1 and Planning Area 2) , Cover MEP System, pump stations, and all other electrical devices that, in each case, form part of the Work. All cost charges from the service provider, and all necessary materials, including meter (if required), labor, and coordination required to maintain existing or establish new Utility services shall be the Developer's responsibility unless specified otherwise in Appendix E Utility Service Matrix to this Section 4.

e. The Developer shall be responsible for the coordination of power source work to be performed by Xcel Energy. The Developer shall contact the Xcel Energy Builder's Call Line at 1-800-628-2121 or by email at bclco@xcelenergy.com to request, and process to completion, the required coordination to establish the Utility service for lighting, ITS, traffic signals, landscaping, Cover (including Planning Area 1 and Planning Area 2),

Cover MEP System, pump stations, and other electrical devices that, in each case, form part of the Work. All power connections to devices shall include a quick-disconnect.

f. The Developer shall obtain approval of the design from the Utility service provider and coordinate and meet all requirements as specified by the Utility service provider for the complete and operational Utility service to all required locations.

4.2.9. Utility Work

Unless stated otherwise, Utility Work includes, but is not limited to, the following activities:

a. Verification of all Utilities, as identified or described in the Utility Data, and the identification of all other Utilities, including in each case all necessary potholing located within the Construction Work or otherwise impacted by the Construction Work, excluding verification associated with a Private Utility Owner's design or Relocation;

b. Development and updating of the Utility Matrix;

c. Preparation and execution of Utility No-Conflict Closeout Forms;

d. Negotiation, preparation, and execution of the Utility Work Order for each Utility Relocation and Utility service, including preparation and provision of such written information concerning the Construction Work (such as reports, plans and surveys) as required to fully identify the extent of such Utility Relocation and as reasonably requested by the Department and the Utility Owner, provided that, in relation to any Utility Relocation of a Utility owned by Sprint, Sprint is not required to execute Utility Work Orders and, accordingly, any Sprint Work Order shall only be executed by CDOT and the Developer recording the terms that have been agreed with Sprint in relation to the implementation of the relevant Utility Relocation;

e. Preparation of Utility Relocation design for each Utility Relocation of a Public Utility and obtaining design acceptance from the Publicly Owned Utility by obtaining its execution of a DRAL;

f. Construction and Inspection of Utility Relocations of Public Utilities, including Service Lines, Utility services, temporary Utility Relocations, and obtaining construction acceptance from the Publicly Owned Utility by obtaining its execution of a CRAL;

g. Remove or flow-fill abandoned existing Public Utilities that are greater than 12 inches in diameter;

h. Extension of all existing Utility casing to the limits required by the CDOT Standard Specifications. The Developer shall be responsible to extend casings for Publicly Owned Utilities in connection with the Project. The Developer shall be responsible to coordinate with the Private Utility Owners to locate and extend existing casings in connection with the Project;

i. Review of the Utility Relocation design for each Private Utility and execution of a DRAL certifying that the design of each Utility Relocation (including, for certainty, any Sprint Utility Relocation) is compatible with the Construction Work (except as such process is specifically modified by the URA between CDOT and Zayo Group, LLC);

j. Reimbursement to Private Utility Owners in accordance with the terms of the applicable URA for design costs incurred by such Private Utility Owners in respect of Utility Relocations;

k. Inspection of the Utility Relocation construction for each Private Utility and execution of a CRAL certifying that the construction of each Utility Relocation (including, for certainty, any Sprint Utility Relocation) is compatible with the Construction Work;

l. Reimbursement to Private Utility Owners in accordance with the terms of the applicable URA for Utility Relocation costs incurred by such Utility Owners in performing Utility Relocations within an easement owned by the Private Utility Owner;

m. Reimbursement to Utility Owners for the acquisition of replacement easements and/or Railroad Permits required for Utility Relocations in respect of existing easements shown on the Right-of-Way Exhibits provided in Schedule 10B Contract Drawings;

n. Reimbursement to Public Utility Owners for the acquisition of additional easements and/or Railroad Permits required for Utility Relocations unable to be accommodated within existing Right-of-Way;

o. Resurfacing and restriping of streets and parking areas, and reconstruction of curb and gutter and sidewalks where necessary due to Utility Relocations performed by the Developer, or performed by a Private Utility Owner, within the Site;

p. Compliance with its obligations under Schedule 14 Strategic Communications insofar as such obligations relate to the Utility Work;

q. Performance of traffic control for Utility Work performed by the Developer, or Utility Relocations performed by a Private Utility Owner, within the Site;

r. Provision of survey coordinates, including field staking, as necessary for design and construction of Utility Work performed by the Developer or for Utility Relocations performed by a Private Utility Owner;

s. Performance of Incidental Utility Work (as defined in the applicable URA);

t. Responsibility for payment of all Utility service fees and maintenance of Utility services unless specified otherwise in Appendix E Utility Service Matrix to this Section 4;

u. Provision of as-built plans for Utility Work performed by the Developer, including x, y and z coordinates for all completed Utility Work Orders;

v. Incorporation of Utility as-built plans into Project plans base file for inclusion in all subsequent plan submittals;

w. Identification and removal of abandoned existing Private Utilities as required to complete the Construction Work; and

x. All necessary Construction Work associated with Utility Work.

y. CenturyLink Relocation shall be placed on the proposed Steele/Vasquez Structure to accommodate CNLK-C-201, CNLK-C-202 and CNLK-C-203.

z. Xcel Energy electrical Relocation shall be placed on the proposed Josephine Structure to accommodate XCEL-E- 214.

aa. Level 3 Relocation shall be placed on the proposed Josephine Structure to accommodate LEVEL3-C-202.

4.2.10. Exclusions From Utility Work

Utility Work excludes the following activities:

a. Issuance of any Permit to any Utility Owner;

b. Provision and maintenance of any insurance in excess of the Developer's obligations under the Agreement; and

c. Design and construction of Utility Relocation of Private Utilities, including Service Lines and temporary Utility Relocations, unless identified as a Requested Relocation.

4.2.11. Developer's Responsibility to Perform

a. Without prejudice to the Developer's rights under the Agreement as a result of the occurrence of a Supervening Event, the Developer shall perform all activities included in the Utility Work with respect to each impacted Utility regardless of the following:

i. Whether or not the Utility was identified in the Utility Data or, if identified, whether or not the Utility was accurately identified; or

ii. The type of action, if any (e.g., Utility Relocation, Protection in Place), feasibility, estimated duration of Construction Work, or any other characteristic of any Utility Relocation concept(s) proposed for the Utility in the Utility Data.

b. The Developer shall be responsible for coordinating with Utility Owners in relation to the performance of all Utility Work by the Developer and the performance of all work relating to Utility Relocations by Utility Owners.

4.2.12. Utility Owners

a. Except as otherwise provided in the applicable URA or Utility Work Order, all Utility Work performed by the Developer shall comply with the relevant Utility Relocation Standards. The Developer shall obtain all such written specifications, standards of practice, and construction methods and other information and materials constituting the Utility Relocation Standards from the Utility Owners. In the event of a conflict between the requirements of the Utility Owner set out in the relevant Utility Relocation Standards or the applicable URA and the requirements of the Agreement, the Department will determine, in its sole discretion, which requirement governs. The Developer is responsible for the resolution of any unresolved ambiguity prior to proceeding with any Utility Work.

b. Utility Relocations to be performed by the Developer for any existing Utilities shall be designed and constructed to provide service at least equal to that provided by the existing Utility, unless the Utility Owner approves a lesser replacement.

c. CCD has agreed to reduce the existing 48 inch sanitary sewer York crossing to a 36 inch lesser replacement.

d. In performing the Utility Work, the Developer shall ensure that all Utility Work results in Utilities being located in a manner to allow future Utility maintenance to be performed by the relevant Utility Owner without disruption to the operation or maintenance of the I-70 Mainline, I-270, I-225 and related facilities.

e. Utilities shall not be placed longitudinally within interstate right-of-way as shown in the Reference Documents, nor shall Utility Relocations be allowed within the interstate right-of-way, except as Approved by the Department.

4.3. Identification of Utilities

4.3.1. Department-Supplied Information

The Department has completed an initial Utility investigation and has identified the Utilities that may be impacted by the Construction Work. The Department has not performed a complete investigation of Service Lines or location and size of existing casings. The results of the Department's investigations are indicated in the Utility Data.

4.3.2. Developer's Investigations

a. The Developer shall identify and confirm the existence, exact location, size, and type of all Utilities located within the Site or that might otherwise be impacted by the Construction Work, whether or not such Utilities are shown in the Utility Data, including all potentially impacted Service Lines. Such actions shall include making diligent inquiry at the offices of the Utility Owners, consulting public records, and conducting field studies (such as subsurface Utility engineering), as appropriate, taking into consideration the possibility that Utility Owners may provide inaccurate or inexact information with regard to their Utilities.

b. If the Developer identifies any Utility during such investigations or otherwise during the performance of the Construction Work that was not identified in the Utility Data, the Developer shall notify the Department and the relevant Utility Owner immediately upon

discovery. Thereafter, the Department, the Developer, and the Utility Owner shall either execute a Utility No-Conflict Closeout Form in respect of such Utility, or execute a Utility Work Order in respect of such Utility, including agreement as to whether the Utility Owner or the Developer shall be required to perform the relevant Utility Relocation.

c. The Developer shall, at least monthly, and otherwise upon the Department's reasonable request (a request shall be deemed to be reasonably made by the Department if the relevant Utility Owner has requested such information in accordance with the terms of the relevant URA), deliver to the Department and Utility Owner the updated Utility Matrix, which shall be updated and expanded to include the following information (unless otherwise agreed between the Parties):

i. The relevant number and execution date of each executed Utility Work Order;

ii. Each Utility No-Conflict Closeout Form execution date;

iii. Each DRAL execution date;

iv. Each CRAL execution date;

v. Completed as-built plans delivery date, to or by the Developer, as applicable; and

vi. Identification of all changes made since the immediately prior version of Developer's Utility Matrix.

4.3.3. Utility Work Orders

a. The Utility Owner (except in relation to a Sprint Work Order), the Developer, and the Department, in that order, shall execute a Utility Work Order prior to commencement of any Utility Work to be performed by the Developer or Utility Relocation to be performed by a Utility Owner. The Developer may prepare a single Utility Work Order covering more than one Utility Relocation, Utility Betterment, or Requested Relocation with the consent of the Department and (except in relation to a Sprint Work Order) the relevant Utility Owner.

b. Prior to executing any Utility Work Order, the Developer and the Department shall meet with the relevant Utility Owner to negotiate the relevant draft Utility Work Order, including the following:

i. the scope of work, the implementation schedule, and any exhibits and any other matters required to be agreed pursuant to the URA; and

ii. in accordance with the remaining provisions of this Section, cost and payment responsibility,

provided that any Sprint Work Order shall document such matters as negotiated and agreed by the Developer and Sprint.

c. The costs for Construction Work performed by the Developer under a Utility Work Order for Utility Betterments or Requested Relocations shall be negotiated between the Developer and the Utility Owner. If it is agreed that the Utility Owner will reimburse the Developer for any costs in connection with Utility Work, the Developer shall provide a cost estimate to the Utility Owner in accordance with the Utility Owner's standard practice and (except in relation to Sprint) with the requirements of the applicable URA, and shall submit such estimate to the Department. After cost estimate Approval by the Utility Owner and the Department, the estimate shall be incorporated into the applicable draft Utility Work Order (and, if it is agreed that Sprint will reimburse the Developer for any costs, as otherwise agreed and documented by the Developer and Sprint). If it is agreed that a Utility Owner is responsible for the payment of any amount of the cost of a Utility Betterment or Requested Relocation, payment shall be made directly by the Utility Owner to the Developer. The Department shall not be responsible for the payment of any amount with respect to a Utility Betterment or Requested Relocation other than as expressly provided for in any URA or Utility Work Order.

d. The costs for Construction Work in respect of Utility Relocations within a Private Utility Owner's permanent easement, or any Utility Relocation design work performed by a Private Utility Owner under a Utility Work Order, shall be negotiated between the Developer and the Private Utility Owner. If it is agreed that the Developer will reimburse a Private Utility Owner for any such costs, the Developer shall obtain a definitive cost estimate from the Private Utility Owner in accordance with the requirements of the applicable URA or the Private Utility Owner's standard practice, and shall submit such estimate to the Department. After cost estimate Approval by the Developer and the Department, the estimate shall be incorporated into the applicable Utility Work Order. If the Developer is responsible for the payment of any such costs, that amount shall be paid directly to the Private Utility Owner.

e. For Utility Betterments and Requested Relocations, the draft Utility Work Order shall include the direct impact of such Utility Work Order on the performance of the Construction Work and the Developer's ability to follow the Project Schedule, in each case taking into account the Developer's obligations under the Agreement, and such other information as the Department may reasonably require.

f. On the basis of the meetings held in accordance with this Section 4, the Developer shall submit each draft Utility Work Order to the Department for Acceptance.

g. The Developer shall submit each Accepted draft Utility Work Order to the Utility Owner (other than in the case of an Accepted draft Sprint Work Order) for approval and itself execute the Utility Work Order (including any Sprint Work Order).

h. The Developer shall submit the Utility Owner approved Utility Work Order (or Developer executed Sprint Work Order) to the Department for Approval.

i. After Approval of a Utility Work Order the Developer shall thereafter perform the Utility Work for which it is responsible pursuant to such Utility Work Order as part of the Construction Work.

j. The Developer shall propose revisions to any Utility Work Order if and when necessary in accordance with the terms of the applicable URA (or, in the case of a Sprint Work Order, if and when necessary following agreement between the Developer and Sprint of any revised terms for the implementation of the relevant Utility Relocation). Such a revised Utility Work Order shall be drafted and executed in accordance with the same procedures applicable to the drafting, Approval and execution of the original Utility Work Order under this Section 4.

4.3.4. Damage to Utilities Caused by the Developer

a. The Developer shall be responsible for any damage caused by the Developer or any Developer-Related Entities to Utilities, property (whether personal or real), equipment, or facilities of Utility Owners or their Affiliates.

b. The Developer shall immediately notify the affected Utility Owner of any such damage caused by a Developer-Related Entity during performance of the Construction Work, and copy the Department, for Information, no later than seven days following Utility Owner notification. Promptly after the Developer's discovery of such damage, or the Developer's receipt of notice of any such damage from the Utility Owner or from any other source:

i. The Developer shall repair the damage to the Utility Owner's satisfaction; or

ii. At the Utility Owner's election, the Utility Owner may make such repairs at the Developer's expense. The Developer shall make payment to a Utility Owner within 60 Calendar Days after receipt of the Owner's invoice.

4.3.5. Multiple Moves

The Developer shall be responsible for all costs incurred by the Department, the Developer, or a Utility Owner to subsequently relocate any Utility already permanently relocated to accommodate the Construction Work.

4.4. **Utility Coordination**

4.4.1. General

The Developer shall be responsible for all coordination with affected Utility Owners to accomplish each Utility Relocation in accordance with the applicable URA. In the discharge of its coordination responsibilities, the Developer shall:

a. Keep Utility Owners fully informed of schedules with regard to Utility Work and other Construction Work relevant to the Utility Work or to Utility Relocations to be performed by the Utility Owner. The Developer shall provide to the Utility Owners, as soon as practicable, an estimated schedule for the relevant Utility Work and/or other relevant Construction Work and shall notify the Utility Owners of any changes to the schedule as soon as practicable;

b. Keep Utility Owners fully informed of changes that affect their Utilities;

c. Consider, to the extent practicable, Utility Owners' needs for the allocation of resources to perform their respective Utility Work in a timely manner;

d. Keep Utility Owners involved in making decisions that affect their Utilities so Utility Owners are able to provide uninterrupted service to their customers, or to be subject to the least interruption practicable as approved by the Utility Owner; and

e. Avoid multiple Utility Relocations of the same Private Utility.

4.4.2. Utility Meetings

a. Between the Developer and Utility Owners

In addition to any meetings or negotiations required in accordance with the Agreement, after execution of a Utility Work Order, the Developer shall schedule regular meetings with the relevant Utility Owner to discuss the progress of the Utility Work and any Utility Relocation being performed by the Developer or the Utility Owner, respectively, pursuant to or as contemplated by the terms of the Utility Work Order. The Developer shall not unreasonably deny any request by a Utility Owner to meet regarding any Utility Work being performed by the Developer or Utility Relocation being performed by the Utility Owner. The Developer shall provide the Department with at least seven Calendar Days' prior notice of any meeting with a Utility Owner, unless a shorter notice period is agreed by the Department or is reasonably necessary under the circumstances and the Department shall be entitled, at its discretion, to attend any such meeting.

b. Between the Department and the Developer

i. The Developer and the Department shall meet at least monthly and otherwise as reasonably requested by the other Party to discuss and resolve matters relating to the Utility Work being performed by the Developer or Utility Relocation being performed by the Utility Owner; and

ii. The Party proposing a meeting shall provide the other Party with a minimum of five Working Days' prior notice of any proposed meeting, unless a shorter notice period is agreed or reasonably necessary under the circumstances.

c. Minutes

The Developer shall produce minutes of all such meetings with Utility Owners and/or the Department and shall distribute copies of the minutes to the Department and, when such

meetings were attended by a Utility Owner, to the relevant Utility Owner, not later than four Working Days after each meeting.

4.4.3. Schedules

a. The Developer shall allow appropriate time periods for the performance of all tasks shown on each Utility Work Order, including design, material procurement and construction whether performed by the Developer or Utility Owner.

b. All schedules and deadlines for the design and construction of Utility Work or Utility Relocation Work to be performed by the Utility Owner set forth in the Utility Work Orders shall prevail over any estimated times noted in the Utility Data.

4.4.4. Notices

a. To Utility Owners

i. The Developer shall issue all notices in writing to the Utility Owners, including notices required to be submitted under the URAs, with copies submitted to the Department, for Information, no later than seven Calendar Days after the issuance to the Utility Owner.

ii. Notice shall be given to respective Utility Owners when the Developer is performing Construction Work adjacent to their Utilities. The Developer shall be solely responsible for and liable for any damage to any Utilities that are damaged due to the Work.

b. To the Department

i. The Developer shall be responsible for verifying progress on a Utility Relocation performed by the Utility Owner and for notifying the Department should the Developer have cause to believe that the Utility Owner will not meet the specified time frame(s) in the Utility Work Order. Without prejudice to any obligations of the Developer arising as a result of the occurrence of any Supervening Event, the Developer shall provide such written notice to the Department immediately after becoming aware of any such delay.

ii. If the Utility Owner is performing a Utility Relocation that requires a Permit, the Developer shall verify with the Department that the required Permit has been obtained and is being complied with. If the Developer determines that the Utility Owner does not have the required Permit, or is in violation of the terms and conditions of such Permit, the Developer shall provide written notice to the Department immediately after making such determination.

c. To Utility Notification Center of Colorado

The Developer shall arrange for the Utility Notification Center of Colorado (UNCC) to provide software and training for the Developer to order call tickets to have Utility field locates performed. The Developer shall contact UNCC to make arrangements for the training. This will allow the Developer to order its own call tickets via e-mail.

4.5. **Failure of Utility Owner to Cooperate or Timely Perform**

4.5.1. The Developer shall use Reasonable Efforts to obtain the cooperation of each Utility Owner as necessary for carrying out the Utility Work. Without prejudice to any obligations of the Developer arising as a result of the occurrence of any Supervening Event, the Developer shall notify the Department immediately if:

a. The Developer becomes aware that any Utility Owner is not cooperating in identifying Utilities, negotiating or executing Utility Work Orders (or, in the case of Sprint, any Sprint Reimbursement Agreement), performing any Utility Relocation, approving any Utility Work, or delivering DRALs or CRALs; or

b. A Utility Owner fails to complete design and/or any Utility Relocation for which it is responsible on or before the deadline established in the applicable Utility Work Order; or

c. Based on the progress made by the relevant Utility Owner, the Developer believes that there is a possibility that the Utility Owner will not complete a Utility Relocation being undertaken by the Utility Owner or any other Utility Work as required pursuant to or contemplated by a Utility Work Order, to the extent and in the manner shown on the Utility Drawings, within the time limits set out in the applicable Utility Work Order; and

d. In the case of each of a, b or c, advising the Department whether the Developer has complied in all respects with the requirements of this Section including compliance with the applicable URA and the applicable Utility Work Order with respect to the relevant portion of the Utility Work.

4.5.2. After delivery of any such notice, the Developer shall continue to diligently pursue the Utility Owner's cooperation and shall assist the Department in any attempts to reach a solution, including through the dispute resolution procedure outlined in the applicable URA. The Developer shall document any incurred costs as a direct result of the Utility Owner's failure to cooperate or perform its obligations under the applicable URA or as contemplated by any Utility Work Order in a timely manner.

4.5.3. In the event that the Department asserts a Claim against a Utility Owner, including as contemplated by Section 15.7.3 of the Project Agreement, the Developer shall cooperate as reasonably requested by the Department in connection with any such Claim, including by participating in any proceeding related to such Claim as required, and causing Developer-Related Entities to act as witnesses in any proceedings and to provide information, reports, graphs, photos, plans, renderings, and similar materials to the Department's legal counsel at the Developer's expense.

4.6. **Utility Work Procedure**

4.6.1. Utility Agreements

a. The Reference Documents include URAs with each Utility Owner whose Utilities are known to, or may be, affected by the Construction Work.

b. The Developer shall be responsible for negotiating the terms of the Sprint Reimbursement Agreement and entering into the same with Sprint prior to the commencement of any physical construction related to any Sprint owned Utility (including as contemplated in the Preliminary Engineering Reimbursement Agreement dated February 17, 2017 between Sprint and CDOT, a copy of which is included in the Reference Documents). A form of construction reimbursement agreement has been provided in the Reference Documents. The Developer shall submit the proposed form of agreement to the Department for review, and obtain the Department's Acceptance thereof, prior to its execution.

c. If the Developer identifies Utility Work that is required in relation to a Utility owned by a Utility Owner (other than Sprint) that has not entered into a URA with the Department in respect of the Project, the Department may, but is not required to, enter into such an agreement with such Utility Owner. The Developer shall not be a party to any such agreement. The Department (and not the Developer) shall be responsible for drafting and negotiating the agreement, provided that:

i. To the extent reasonably requested by the Department, the Developer shall provide assistance to the Department in connection with such negotiations, including by the provisions to the Department of information in the Developer's possession, relating to Utilities owned by the relevant Utility Owner that will, or may be, impacted by the Project;

ii. Until such agreement has been executed by the Utility Owner and the Department, the Developer shall be responsible for coordinating with such Utility Owner as if it had executed such an agreement; and

iii. If the Department requires the Developer to comply with any of the terms of such agreement, it shall designate it as a "Third Party Agreement" pursuant to Section 8.5.2 of the Project Agreement.

4.6.2. Utility As-Built Plans and Utility Drawings

a. Where the Utility Owner performs the Utility Work, the Utility Owner is required in accordance with the terms of its URA to provide as-built plans of the Utility Relocation to Department and to the Developer, not later than 90 Calendar Days after execution of the relevant CRAL. The as-built plans may be in the form of redlining changes that deviate from the Accepted DRAL plans or labeling the accepted DRAL plans "constructed per plan." The Developer shall show the Utility as-built information on its final As-Built drawings for the Project;

b. Where the Developer performs the Utility Work, the Developer shall provide as-built plans of the Utility Relocation to the Department and the Utility Owner but in any event not later than 90 Calendar Days after execution of the relevant CRAL. The as-built plans may be in the form of redlining changes that deviate from the Accepted DRAL plans or labeling the accepted DRAL plans "constructed per plan." The Developer shall show the Utility as-built information on its final As-Built drawings for the Project; and

c. Quarterly (and at such other times as reasonably requested by the Department), the Developer shall update the Utility Drawings provided in the Reference Documents and submit the updated versions to the Department for Acceptance.

4.7. **Deliverables**

4.7.1. For all deliverables required under this Section, the Developer shall also provide, at a minimum and as applicable, the following:

a. Utility Plan Sheet;

b. ROW Plans;

c. Most current roadway and drainage plans;

d. Utility exhibits (including existing and proposed Utility locations);

e. Cost estimate (if applicable); and

f. x, y and z coordinates of Utility Relocations.

4.7.2. For all Utility Work Orders in respect of a Utility Relocation of a Public Utility, the Developer shall prepare and include the following Utility Plan deliverables in its submittal:

a. Plan View;

i. All Utilities shall be accurately shown and labeled with appropriate Utility identification number; and

ii. Plans shall include existing topography, property boundaries, drainage facilities, structures, traffic features and all other existing and proposed facilities.

b. Profiles;

i. All Utilities shall be accurately shown and labeled with appropriate Utility ID number;

ii. Provide profiles for all existing and proposed Utility lines eight inches and larger. Include the Utility ID number from plan view sheets, station and offset, elevations, sizes, material, existing and proposed finished grade line; and

iii. All clearances between drainage facilities and Utilities shall be clearly labeled.

c. Accepted Construction Plans for Utilities included with the DRAL;

d. Plans for all Utility related facilities for the Construction Work in a format that follows the Utility Owner's standards; and

e. All other applicable plans with all changes to design.

4.7.3. Utility As-Built Documents

All information as described in Table 4-1 shall be updated based on As-Built survey and submitted to the Department for Acceptance.

4.7.4. At a minimum, the Developer shall submit the following to the Department for Information, Acceptance, or Approval in accordance with the timeframes specified:

Table 4-1 Deliverables

Deliverable	Information, Acceptance, or Approval	Schedule
Developer's Utility Matrix	Information	Monthly or at the Department's request
Utility No-Conflict Closeout	Acceptance	Prior to RFC Documents
Utility Relocation cost estimate	Approval	Prior to RFC Documents
Draft Utility Work Order	Acceptance	Prior to RFC Documents
Utility Work Order	Approval	Prior to RFC Documents
Sprint Reimbursement Agreement	Acceptance	Prior to execution
DRAL	Acceptance	Prior to RFC Documents
CRAL	Acceptance	Per Project Schedule
Updated Utility Drawings	Acceptance	Quarterly (and at such others times as reasonably requested by the Department)
Utility As-Built plans	Acceptance	90 Calendar Days after execution of CRAL
Public Utility Plan submittal	Acceptance	Prior to RFC Documents
Meeting minutes	Acceptance	Four Working Days after meeting
Copy of written notice to Utility Owners	Information	Seven Calendar Days after Utility Owner notification
Written notice of Utility Owner not meeting Work Order time frame	Information	As Required
Written notice of Permit violation	Information	As Required
Written notice of failure of Utility Owner to cooperate or timely perform	Information	As Required

4.8. **Appendices**

Appendix A Utility No-Conflict Closeout Form

Appendix B Form of Utility Work Order

Appendix C Form of Design of Relocation Acceptance Letter (DRAL)

Appendix D Form of Construction of Relocation Acceptance Letter (CRAL)

Appendix E Utility Service Matrix

Appendix A
Utility No-Conflict Closeout Form

This Utility No-Conflict Closeout Form ("No-Conflict Form") is executed by the Utility Owner and the CDOT Developer in connection with the Central 70 Project Utility Relocation Agreement ("URA") entered into by the Utility Owner and CDOT. Unless the context clearly otherwise requires, initially capitalized terms shall have the meaning prescribed to them in the URA.

A fully-executed No-Conflict Form indicates the Parties' concurrence that, as of the Project plans current at the date of Utility Owner's execution hereof, no Relocation is required for Utility Owner's Utility referenced herein. Utility Owner and the CDOT Developer acknowledge that future modifications to the Project may require Relocation of the referenced Utility in accordance with the URA. Two originals shall be executed and a copy shall be forwarded to CDOT by the CDOT Developer.

Utility Owner	
Utility Identification No.:	
Location	
Comments (attach pages as necessary)	

FOR UTILITY OWNER

By: _____ Date: _____
Name:
Title:

FOR CDOT DEVELOPER

By:_____ Date: _____
Name:
Title:

If this form is not signed by the Utility Owner, the Utility Owner shall state below its basis for disagreement with the No-Conflict designation for this Utility:

_____

_____

_____

_____

_____

(attach pages as necessary)

Appendix B
Form of Utility Work Order

Utility Owner: _____

Utility Identification No.: _____

Work Order No.: _____ Work Order Revision No.: _____

Work Breakdown Structure No.: _____

LOCATION:

DESCRIPTION:

OPERATING RIGHTS:

DESIGN

☐ No Design Required

Performing Party ☐ Contractor ☐ Owner

Responsible Party ☐ Contractor ☐ Owner

Contractor pays Owner Lump Sum: _____ Actual Cost Not to Exceed: _____

Owner pays Contractor Lump Sum: _____ Actual Cost Not to Exceed: _____

Comments _____

CONSTRUCTION

☐ No Construction Required

Performing Party ☐ Contractor ☐ Owner

Responsible Party ☐ Contractor ☐ Owner

Contractor pays Owner Lump Sum: _____ Actual Cost Not to Exceed: _____

Owner pays Contractor Lump Sum: _____ Actual Cost Not to Exceed: _____

Comments _____

CONSTRUCTION INSPECTION

☐ No Construction Inspection Required

Performing Party ☐ Contractor ☐ Owner:

Responsible Party ☐ Contractor ☐ Owner:

Contractor pays Owner Lump Sum: _____ Actual Cost Not to Exceed: _____

Owner pays Contractor Lump Sum: _____ Actual Cost Not to Exceed: _____

Comments _____

PROPERTY ACQUISITION

☐ No Property Acquisition Required

Performing Party ☐ Contractor ☐ Owner:

Responsible Party ☐ Contractor ☐ Owner:

Contractor pays Owner Lump Sum: _____ Actual Cost Not to Exceed: _____

Owner pays Contractor Lump Sum: _____ Actual Cost Not to Exceed: _____

Comments _____

SCHEDULE (THIS WORK ORDER ONLY)

Design		**Construction**	
Start Date:	_____	Start Date:	_____
Completion Date:		Completion Date:	
Comments:			

CHANGE ORDER

If this section is signed by the CDOT representative, then this Work Order will function as a Change Order.

_____

CDOT Representative Date

WORK ORDER TERMS AND CONDITIONS[1]

SCOPE OF WORK ORDER. This Work Order is entered into by and among Utility Owner and CDOT, and, where applicable, the CDOT Developer in order to implement in part the URA identified herein, as the same may be amended from time to time, and which is incorporated herein by this reference. All work undertaken pursuant to this Work Order shall be performed in accordance with the requirements of the URA, which shall govern to the extent of any conflict between its terms and the terms of this Work Order. Relocation Standards specifically identified in the URA are incorporated herein by this reference. Unless otherwise defined herein, all initially capitalized terms and conditions shall have the meaning prescribed to them in the URA.

WORK ORDER ATTACHMENTS. This Work Order and any attachments hereto contain information specific to the Relocation to be performed hereunder. Attached and/or referenced Relocation Standards are incorporated herein by this reference and shall be considered a part of this Work Order. This Work Order governs only the Utility Work specifically identified herein and shall be conclusive as to all matters represented herein.

ORDER OF EXECUTION. This Work Order shall be executed first by Utility Owner, then by the CDOT Developer (if applicable) and finally by CDOT.

IN WITNESS WHEREOF, CDOT, the Utility Owner, and where applicable, the CDOT Developer have executed this Work Order, which shall be effective as of the date of the CDOT's signature.

Utility Owner: _____
By: _____
Print Name: _____
Title: _____
Date: _____

CDOT Developer: _____
By: _____
Print Name: _____
Title: _____
Date: _____

CDOT: _____
By: _____
Print Name: _____

[1]In the case of a Sprint Work Order, revise to (a) reflect that the work order will be executed by the Developer and CDOT (but not Sprint) and (b) refer to the applicable Sprint Reimbursement Agreement.

Title: _____

Date: _____

Utility Identification No.:

SECTION A	SCOPE

SECTION B	REQUIRED PERMITS

Permit Type	Permit Responsibility

SECTION C	LIST OF ATTACHMENTS

☐ Owner Design Sheet _____

☐ Project Design Sheet _____

☐ Cost Estimate _____

☐ Property Rights _____

☐ Other: _____

Appendix C
Form of Design of Relocation Acceptance Letter (DRAL)

This DESIGN OF RELOCATION ACCEPTANCE LETTER ("DRAL") is executed by the non-Designing Party in connection with the Central 70 Project Utility Relocation Agreement (URA), entered into by the Utility Owner and CDOT. Execution of this DRAL indicates the non-Designing Party's acceptance and approval of the design of the Relocation, as attached to this DRAL, performed and completed by the Designing Party. Unless otherwise defined herein, initially capitalized terms shall have the meaning prescribed to them in the URA. Two originals shall be executed and a copy shall be forwarded to CDOT by the CDOT Developer.[2]

Utility Owner: _____

Utility Identification No.: _____

Work Order No.: _____ Work Order Date: _____

Work Order Rev. No.: _____ Rev. Date: _____

Designing Party: _____

Now, therefore, the non-Designing Party executes this DRAL to indicate that it has reviewed the design of the Relocation completed by the Designing Party and has found the design of the Relocation to have been designed in accordance with the non-Designing Party's Relocation Standards duly provided to the Designing Party:

Non-Designing Party

By: _____
Name: _____.
Title: _____.
Date: _____

☐ The non-Designing Party declines execution of this DRAL at this time for the following reasons:

_____

_____

_____ (attach pages as necessary)

☐ The Constructing Party may proceed with construction of the Relocation.

_____

[2] In relation to a Sprint Utility Relocation, revise this paragraph to refer to the applicable Sprint Reimbursement Agreement entered into between Sprint and the Developer.

Appendix D
Form of Construction of Relocation Acceptance Letter (CRAL)

This CONSTRUCTION OF RELOCATION ACCEPTANCE LETTER ("CRAL") is executed by the non-Constructing Party in connection with the Central 70 Project Utility Relocation Agreement (URA) entered into by the Utility Owner and CDOT. Execution of this CRAL indicates the non-Constructing Party's Inspection and acceptance of the construction of the Relocation performed and completed by the Constructing Party. Unless otherwise defined herein, initially capitalized terms shall have the meaning prescribed to them in the URA. Two originals shall be executed and a copy shall be forwarded to CDOT by the CDOT Developer.[3]

The construction of the Relocation inspected and accepted by execution hereof is described below:

Utility Owner: _____

Utility Identification No.: _____

Work Order No.: _____ Work Order Date: _____

WO Revision No.: _____ WO Revision Date: _____

Constructing Party:_____

Now, therefore, the non-Constructing Party executes this CRAL to indicate that it has inspected the construction of the Relocation completed by the Constructing Party and has found the construction of the Relocation has been performed in accordance with the Relocation Plans:

NON-CONSTRUCTING PARTY

By: _____

Name: _____

Title: _____

Date: _____

☐ The non-Constructing Party declines execution of this CRAL at this time for the following reasons:

[3] In relation to a Sprint Utility Relocation, revise this paragraph to refer to the applicable Sprint Reimbursement Agreement entered into between Sprint and the Developer.

(attach pages as necessary)

Appendix E
Utility Service Matrix

Element	Utility Service Fees		Maintenance of Utility Service	
	During Construction (until Final Acceptance)	Operating Period (from Final Acceptance)	During Construction (until Final Acceptance)	Operating Period (from Final Acceptance)
Street Lighting and Pedestrian Lighting				
Existing Permanent Street Lighting	CCD Flat Rate	NA	Xcel	NA
Proposed Street Lighting (Local Agency Roadway)	CCD Flat Rate	CCD Flat Rate	Developer	Xcel
Proposed Street Lighting (Highway)	CCD Flat Rate	CCD Flat Rate	Developer	Xcel
Permanent Pedestrian Lighting (excluding Cover)	Developer Meter	CCD Flat Rate	Developer	Xcel
Permanent Pedestrian Lighting "Premium Landscape" Areas as depicted in the Corridor Landscape Exhibit	Developer Meter	Cover Maintainer Meter	Developer	Cover Maintainer
Temporary Street/Pedestrian Lighting	Developer Meter	NA	Developer	NA
Traffic Signals				
Existing Traffic Signals	CCD Flat Rate/Meter	NA	CCD	NA
Proposed Permanent Traffic Signals	Developer Meter	CCD Meter	Developer	CCD
Temporary Traffic Signal	Developer Meter	NA	Developer	NA
Cover MEP System				
Cover MEP System Facilities (e.g. maintenance building) Lighting, Pump, Fans	Developer Meter	Developer Meter	Developer	Developer
Cover				
Cover Facilities- Planning Area 2(e.g. concession/restroom buildings), Lighting, Landscape sprinklers, Splash pad (excluding street lighting and pedestrian lighting)	Developer Meter	Cover Maintainer Meter	Developer	Cover Maintainer
Planning Area 1 (e.g. Parking Lot Lighting, Landscaping)	Developer Meter	Denver Public School Meter	Developer	Denver Public School
ITS/ETC				
ITS	Developer Meter	Department Meter	Developer	Department
ETC	Developer Meter	ETC System Integrator Meter	Developer	ETC System Integrator

Element	Utility Service Fees		Maintenance of Utility Service	
	During Construction (until Final Acceptance)	**Operating Period (from Final Acceptance)**	**During Construction (until Final Acceptance)**	**Operating Period (from Final Acceptance)**
Drainage				
Pump	Developer Meter	Developer Meter	Developer	Developer
Landscape Irrigation Power (excluding Cover)				
Landscape Sprinklers	Developer Meter	CCD Meter	Developer	CCD
Water Utility				
Proposed Water Tap Fire Suppressant (Denver Water System Development Charges)	Department	N/A	N/A	N/A
Proposed Water Tap Fire Suppressant (Denver Water Department "physical construction" e.g. tapping labor, brass meter, inspection fees etc.)	Developer Meter	Developer Meter	Developer	Developer
Proposed Water Tap Landscape Irrigation including Cover(Denver Water System Development Charges)	Department	N/A	N/A	N/A
Proposed Water Tap Landscape Irrigation including Cover (Denver Water Department "physical construction" e.g. tapping labor, brass meter, inspection fees etc.)	Developer Meter	CCD Meter	Developer	CCD
Gas Utility				
Proposed Gas Tap for Cover MEP System	Developer Meter	Developer Meter	Developer	Developer
Proposed Gas/Generator ITS Node Buildings	Developer Meter	Department Meter	Developer	Department
Maintenance Yard[4]				
Maintenance Yard	Developer (from the Snow and Ice Control Commencement Date) Meter	Developer Meter	Developer (from the Snow and Ice Control Commencement Date)	Developer

Note: Does not include facilities for Developer as per Schedule 8 Project Administration

[4] This section of Appendix E will be deleted if the Preferred Proposer elects not to use the Maintenance Yard.

5. SURVEY

5.1 General

The Developer shall be responsible for the surveying Activities necessary to support the Construction Work, including ongoing operations and maintenance.

5.2 Applicable Standards

All Construction Work required to be performed by the Developer pursuant to this Section shall comply with the Construction Standards, the relevant requirements listed in this Section, and Law related to surveys.

5.3 Administrative Requirements

5.3.1 Project Survey Coordinator

The Developer shall designate a Colorado registered professional land surveyor as the Project Survey Coordinator. The Project Survey Coordinator shall be responsible for all survey Activities required to be carried out by the Developer under the Project Agreement, including directing and reviewing all such Activities, being the point of contact for all such Activities and supervising the carrying out of such Activities.

5.3.2 Supplied Survey Data

a. The survey control point information completed by the Department is included in the Supplied Survey Data.

b. Survey and mapping information completed by the Department is provided in the Reference Documents. The Developer may utilize the Supplied Survey Data, at its discretion, and shall be responsible to conduct additional surveys necessary in accordance with this Section 5. The Developer shall form its own interpretation of the existing survey data included as to its suitability and sufficiency for the Developer's detailed design.

c. The Developer shall submit a Supplied Survey Data verification letter including records of relevant survey data verification, to the Department, for Information, within 60 Calendar Days after issuance of NTP1.

d. For reference only and subject always to Section 3 of the Project Agreement, Table 5-1 provides a description of the survey and mapping information provided by the Department.

Table 5-1 Supplied Survey and Mapping Information

Survey and Mapping Information	Description of Data
I-25 to Sand Creek	Obtained from 2013 stereo aerial photography for all visible features in the photography consistent with 1"=50' mapping as described in the CDOT *Survey Manual*. Planimetrics are formatted per the CDOT *CADD Manual* in the Bentley Microstation environment.
Sand Creek to Airport Boulevard	Obtained from 2014 stereo aerial photography for all visible features in the photography consistent with 1"=50' mapping as described in the CDOT *Survey Manual*. Planimetrics are formatted per the CDOT *CADD Manual* in the Bentley Microstation environment.
Union Pacific Railroad (UPRR) and 46th Avenue: Brighton Boulevard to Garfield Street (under viaduct)	Data obtained in 2013 using a combination of Global Positioning System (GPS), Total Station and High Definition Scanning (HDS) Survey. Field and mapping procedures achieve a 95 percent confidence level, as defined in the CDOT *Survey Manual*. Digital Terrain Model (DTM) is formatted per the CDOT *CADD Manual* in the Bentley Inroads environment. Planimetrics are formatted per the CDOT *CADD Manual* in the Bentley Microstation environment.
Storm and Sanitary Sewer Manhole Survey: Brighton Boulevard to Sand Creek and Storm Drain Outfalls	Obtained in 2014 from Real Time Kinematic (RTK) GPS and Total Station field survey, and consistent with the accuracy requirements described in Chapter Five of the CDOT *Survey Manual.*
Storm and Sanitary Sewer Manhole Survey – Sand Creek to Airport Road	Obtained in 2015 from RTK GPS and Total Station field survey, and consistent with the accuracy requirements described in Chapter Five of the CDOT *Survey Manual.*
Utility Locates Survey: Brighton Boulevard to Sand Creek and Storm Drain Outfalls	Obtained in 2014 from RTK GPS and Total Station field survey, and consistent with the accuracy requirements described in Chapter Five of the CDOT *Survey Manual.*
Utility Locates Survey: Sand Creek to Airport Road	Obtained in 2015 from RTK GPS and Total Station field survey, and consistent with the accuracy requirements described in Chapter Five of the CDOT *Survey Manual.*

5.3.3 Additional Survey Data

a. Without prejudice to Section 3 of the Project Agreement, the Developer shall be responsible for identifying the need for, and undertaking additional surveys required to produce, any Additional Survey Data that may be required for the Construction Work. The required information may include topographic surveys, survey of Utilities, and miscellaneous surveying as necessary to complete the Construction Work. All traffic control and Permits necessary to complete such surveys shall be the responsibility of the Developer.

b. The Developer shall obtain all necessary right-of-entry agreements to land and property outside the Right-of-Way (ROW).

c. Within 60 Calendar Days of the completed additional survey, the Developer shall submit the Additional Survey Data to the Department for Information.

5.4 Survey Requirements

5.4.1 Preservation of Survey Markers and Monuments

The Developer shall:

a. Preserve all survey markers, including City of Denver (CCD) range point markers, and monuments;

b. Inform the Department (and the relevant Local Agency, if affected) in the event that the Developer identifies a survey marker or monument that is in a position that will interfere with the performance of the Construction Work and, in such cases, accurately record the position of any marker or monument prior to disturbance;

c. Submit documentation to the Department (and, if affected, the Local Agency) relating to the preservation and/or monumentation, as applicable, of survey monuments. Documentation submitted to the Local Agency shall meet the relevant Local Agency requirements;

d. Immediately notify the Department (and, if affected, the Local Agency) in the event that any CDOT survey monuments or CCD range point markers are at risk of being destroyed, or are lost or destroyed, during the performance of the Construction Work;

e. Assume that the Local Agency affected will send a new marker disk to the Developer, which has been properly stamped, together with instructions for establishment of the new marker, failing which the Department will provide a new marker disk;

f. The Developer shall set the new marker under the direct supervision of the Project Survey Coordinator or other Colorado registered professional land surveyor and, where required by Applicable Law, shall bear the registration number of the responsible professional land surveyor; and

g. The Developer shall coordinate with all applicable Local Agencies that will or may be affected by the performance of the Construction Work. The Developer shall protect and restore any such monuments, as required, to complete the Construction Work.

5.4.2 Survey Records Report

a. The Developer shall prepare, maintain and submit to the Department for Information, a Survey Records Report including but not limited to survey documents, records, field notes, drawings, and calculations.

b. All survey records shall be neat, legible, accurate, and maintained by the Developer in a neat and orderly manner.

c. The Project Survey Coordinator shall be required to sign and seal survey documentation in accordance with applicable Law.

5.4.3 Control Surveys

a. The Developer shall be responsible for planning, scheduling, and performing control surveys and monumentation as necessary to maintain and supplement the project control network for the Construction Work.

b. The Developer shall submit to the Department, for Information, a revised project control diagram showing all modifications to the Department's project control network, as provided in the CDOT Interstate I-70 East Viaduct Horizontal and Vertical Control Survey Report for Aerial Mapping Volumes 1 & 2.

5.4.4 Railroad Associated Surveys

The Developer shall plan, schedule and perform staking and construction layout required for the Railroad Construction Work for the UPRR Crossing, UPRR Pepsi Lead Crossing, UPRR York Street Crossing, BNSF Crossing, and DRIR Crossing. Construction staking for Railroad Construction Work shall conform to the requirements of the applicable Railroad.

5.4.5 As-Built Surveys

a. The Developer shall plan, schedule, and perform all surveys required to document the location of As-Built features on the Project.

b. The Developer shall deliver the As-Built data, in InRoads Terrain Modeling Survey System (TMOSS) survey format, and survey records to the Department for Information prior to Final Acceptance. Errors and omissions found by the Department shall be corrected by the Developer and resubmitted.

5.4.6 Right-of-Way Monumentation

a. The Developer shall submit a ROW Monumentation Plan, for Information, to the Department, to document all ROW monuments and Range Points and note any existing, destroyed, moved, replaced or new ROW monuments or Range Points.

b. The Developer shall preserve or re-set if preservation is not possible existing ROW, CCD Range Point, Aliquot, NGS and private monuments for the final ROW configuration. The Developer shall replace all ROW monumentation and/or CCD range point markers lost or destroyed during the progression of the Construction Work.

c. The Department will prepare the ROW Plan sets for the Project including the tabulation of monuments to be set. The Developer shall set all new monumentation for the Project. The ROW Plan sets have two signature blocks, one for the surveyor preparing the plan set and one for the Colorado licensed surveyor setting the monuments. They state that the surveyor signing the plan set block prepared the calculations and the surveyor signing the monument block set the monuments 'depicted' on the plan set.

The Department will provide the coordinates and monuments for ROW monuments (approximately 300) and Range Points (approximately 35) for the Developer to install. The Developer's Colorado licensed surveyor shall sign the ROW Plans signature block (ROW monuments) depicted on the ROW Plan sets that are prepared by CDOT.

5.5 Deliverables

At a minimum, the Developer shall submit the following to the Department for Information, Acceptance, or Approval in accordance with the timeframes specified:

Table 5-2 Deliverables

Deliverable	Information, Acceptance, or Approval	Schedule
Supplied Survey Data verification letter	Information	60 Calendar Days after issuance of NTP1
Additional Survey Data	Information	Within 60 Calendar Days of completed additional survey
Documentation for the preservation or re-monumentation of any survey monument or marker	Information	Submit with As-Built documentation
Revised project control diagram	Information	Prior to Final Acceptance
Survey Records Report	Information	Prior to Final Acceptance
As-Built data and records	Information	Prior to Final Acceptance
ROW Monumentation Plan	Information	Prior to Substantial Completion

6. ROADWAY PAVEMENTS

6.1 General

6.1.1 The Developer shall be responsible for the design and construction of the I-70 Mainline and Local Agency Roadway pavements to meet the requirements and criteria specified in this Section 6.

6.1.2 Roadway pavement segments for CDOT Roadways are provided by the Department. The Developer shall be responsible for material mix designs and construction on these roadways to meet the requirements and criteria specified in this Section 6.

6.1.3 The pavement type for private roadways, accesses, and driveways shall be the same as the existing facility and comply with Local Agency requirements unless otherwise approved by the Department.

6.2 Applicable Standards

6.2.1 All Construction Work required to be performed by the Developer pursuant to this Section 6 shall comply with the Construction Standards, the relevant requirements listed in this Section 6, and Good Industry Practice.

6.2.2 The Developer shall design the I-70 Mainline pavements, including a combination of materials and layer thicknesses for the pavement structure, in accordance with the requirements of the CDOT *M-E Pavement Design Manual*. Pavement design thickness shall be determined in accordance with the AASHTO mechanistic-empirical (M-E) design procedure using AASHTOWare *Pavement M-E Design* software (formerly DARWin-ME™).

6.2.3 The Developer shall design the Local Agency Roadway pavements, including a combination of materials and layer thicknesses for the pavement structure, in accordance with Local Agency standards. The Developer shall use the equivalent single axle load (ESAL) values included in the Local Roadway ESAL Memo provided in the Reference Documents in designing such pavements.

6.2.4 The Developer shall design and construct asphalt pavements for the Swansea Elementary School outdoor areas (Planning Area 1) in conformance with Denver Public Schools Design and Construction Standards.

6.3 Design

6.3.1 Available traffic data is provided in the Reference Documents. The Developer shall conduct such additional traffic data collections as it determines necessary to complete its pavement designs except as provided in Section 6.2.3 of this Section 6.

6.3.2 The Developer is responsible for integrating the pavement designs with the design and construction of effective subsurface drainage and frost protection, including the provision of subdrains or any other drainage treatments.

6.3.3 The asphalt binder required for I-70 Mainline pavements shall be determined using LTPPB using location-specific climate data assuming 98% reliability and slow conditions.

6.3.4 The I-70 Mainline pavement type may be either hot mix asphalt (HMA) or Portland cement concrete pavement (PCCP), provided that the selected pavement type (and section) shall be the same for a minimum of 1,000 feet (in continuous linear distance). The pavement structure shall be the same from edge of pavement to edge of pavement, including shoulders.

6.3.5 The I-70 Mainline pavement type surface may be either hot mix asphalt (HMA) or Portland cement concrete pavement (PCCP), provided that the selected pavement surface, including shoulders, shall be the same for the entire segment between Sand Creek and I-225 (where existing surface type changes from HMA to PCCP). The pavement structure for any full reconstruction areas shall be the same from edge of pavement to edge of pavement, including shoulders. The pavement structure for widened areas shall include the same pavement surface type as the edge of pavement that is being matched, including shoulders.

6.4 Pavement Design Reports and Pavement Designs

6.4.1 The Developer shall prepare and separate Pavement Design Reports for:

a. I-70 Mainline (to be submitted to the Department for Information);

b. Local Agency Roadways pavement designs (to be submitted to the Local Agency for approval and the Department for Information); and

c. Swansea Elementary School pavement designs (to be submitted to Denver Public Schools for approval and the Department for Information).

6.4.2 The Developer's Pavement Design Report submittals shall include the following:

a. The proposed typical pavement sections;

b. Geotechnical data and geotechnical design assumptions;

c. Material property assumptions;

d. Input and output from the pavement M-E design software; and

e. All traffic counts/calculations and assumptions used to determine the proper traffic data that was used.

6.4.3 CDOT Roadway pavement sections shall be constructed as shown in Table 6-1.

Table 6-1 Required Pavement Sections for CDOT Roadways

Street	Aggregate Base Course Class 6	PCCP Reconstruction (inches)	HMA Reconstruction (inches)
Vasquez Boulevard	6.0	9.0 (15' joint spacing, 1.25" dowel) Or 8.0 (12' joint spacing, 1.25" dowel)	7.0
Colorado Boulevard	6.0	9.0 (15' Joint spacing, 1.25" Dowel)	8.0
Quebec Street	6.0	10.0 (12' Joint spacing, 1.5" Dowel)	9.0
I-270	6.0	13.5 (15' Joint spacing, 1.5" Dowel)	13.0

Notes: HMA pavement thicknesses shown are total thicknesses and shall be constructed using a two inch stone matrix asphalt (SMA) top lift and lower lifts using S(100). The minimum thickness of any HMA layer shall be two inches and the maximum thickness of any HMA layer shall be three inches, unless otherwise approved by the Department.

6.4.4 The Developer shall prepare detour pavement designs and submit to the Department for Information.

6.5 Subsurface Investigations

6.5.1 Preliminary subsurface investigations are provided in the Reference Documents. The Developer shall conduct such additional subsurface investigations as it determines necessary to complete its pavement designs.

6.5.2 Geotechnical investigations completed by the Developer for the I-70 Mainline and CDOT Roadways shall comply with the requirements of the CDOT *Field Materials Manual* and the CDOT *Pavement Design Manual*. These shall be documented in a separate geotechnical investigation report and submitted to the Department for Information with the respective

Pavement Design Report (in the case of the I-70 Mainline) and the Preliminary (30%) Level Plan Package (in the case of CDOT Roadways).

6.5.3 Geotechnical investigations completed by the Developer for Local Agency Roadways shall conform to Local Agency requirements. These shall be documented in a separate geotechnical investigation report and shall be submitted to the Local Agency and the Department for Information, with the Pavement Design Report.

6.5.4 Geotechnical investigations completed by the Developer for the Swansea Elementary School shall conform to Denver Public Schools requirements. These shall be documented in a separate geotechnical investigation report and shall be submitted to the DPS and the Department for Information, with the Pavement Design Report.

6.6 Construction Requirements

6.6.1 The Developer shall be responsible for constructing Safety Edge on all pavements as specified in Schedule 10, Section 9 Roadway. Permanent rumble strips are not required as part of the Construction Work.

6.6.2 All PCCP segment shall conform to CDOT Standard Plan M-412-1.

6.6.3 The Developer shall provide for adequate sulfate resistance in all concrete supplied. Severity of potential exposure shall be determined by the Developer in accordance with the CDOT *Field Materials Manual*.

6.6.4 A minimum of 14 Calendar Days prior to the proposed use of any pavement in the Construction Work, a pre-paving conference shall be conducted.

6.6.5 Submission by the Developer, of pavement mix designs, and Acceptance by the Department, for CDOT Roadways and Local Agency Roadways for SMA, HMA, and PCCP, as well as Jointing Plans for PCCP for any roadway, is a condition for the initiation of any paving Construction Work.

6.6.6 Submission by the Developer, for Information, of pavement mix designs for the I-70 Mainline for SMA, HMA, and PCCP, is a condition for the initiation of any paving Construction Work.

6.6.7 In order to facilitate the addition of a Tolled Express Lane in each direction on the existing I-70 Mainline between Sand Creek and Chambers Road, the Developer shall meet the applicable General Requirements and meet or exceed the applicable Targets, as described in Schedule 11 Operations and Maintenance Requirements. In the event that the existing pavement does not meet such requirements, the Developer shall remediate the existing pavement to provide a safe and even surface across the entire width of the pavement. Remediation shall be full lane width, and joints shall match new lane lines. . Within the concrete pavement segment the Developer shall evaluate the location of existing joint lines in the widening and restriping plan to ensure compliance with CDOT Standard Plan M-412-1.

6.6.8 The Developer shall provide a hard capped surface adjacent to the I-70 Mainline shoulders from East of Sand Creek Bridge to I-225. The Developer shall determine the type and thickness of material that shall be used to accommodate the safe emergency storage of disabled vehicles. The hard capped surface shall include the following elements:

a. Smooth matching the grade and cross-slope of adjacent pavement without drop-offs;

b. Type that prevents tracking of material onto the roadway surface; and

c. Be free of the growth of weeds/grass.

The Developer shall be responsible for the maintenance of the hard capped surface for the duration of the Term.

6.6.9 For I-70 Mainline, if PCCP is selected, PCCP shall extend to the limit of the physical gore on all ramps.

6.6.10 Roadway Pavement Materials

a. HMA mixes shall be subject to voids acceptance.

i. SMA acceptance shall be based on gradation.

b. If PCCP is selected, the following shall apply:

i. PCCP shall meet or exceed the minimum compressive or flexural strength requirements in accordance with the CDOT Standard Specifications;

ii. Joint design shall include tied inside and outside shoulders. Outside mainline shoulders shall include doweled transverse contraction joints;

iii. Longitudinal and transverse joint designs shall be compatible with lane and shoulder configurations. Longitudinal joints shall be placed adjacent to lane markings.

iv. The Developer shall texture the I-70 Mainline outside shoulders in accordance with the CDOT Standard Specifications. Final stamping stationing is not required.

6.6.11 Pavement Smoothness

a. The pavement surface shall comply with the smoothness requirements set out in Table 6-2 and Appendix A Project Special Provisions to this Section 6.

b. Intersections constructed with PCCP shall be exempt from Table 6-2 requirements. However, the 10 foot straightedge requirements for both longitudinal and transverse smoothness shall still apply, except in locations where plan grade and profile deviate from a planar surface, in which case deviations from a 10 foot straight edge are reasonably expected.

Table 6-2 Smoothness Requirements

Location	Pavement Smoothness Category
Flexible pavement (Full Depth)	MRI Category II
Rigid pavement	MRI Category II
Overlay	MRI Category I
Detour	In accordance with Appendix A Project Special Provisions

6.7 Deliverables

At a minimum, the Developer shall submit the following to the Department for Information, Acceptance, or Approval in accordance with the specified timeframes:

Table 6-3 Deliverables

Deliverable	Information, Acceptance, or Approval	Schedule
Supplemental geotechnical investigation report – I-70 Mainline	Information	Submitted with Pavement Design Report
Supplemental geotechnical investigation report – CDOT Roadways	Information	Concurrent with Preliminary (30%) Level Plan Package
Supplemental geotechnical investigation report – Local Agency Roadways	Information	Submitted with Pavement Design Report
Supplemental geotechnical investigation report – Swansea Elementary School outdoor areas	Information	Submitted with Pavement Design Report
I-70 Mainline Pavement Design Report	Information	Concurrent with Preliminary (30%) Level Plan Package

Deliverable	Information, Acceptance, or Approval	Schedule
Local Agency Roadways Pavement Design Report	Information	Concurrent with Preliminary (30%) Level Plan Package
Swansea Elementary School outdoor areas Pavement Design Report	Information	Concurrent with Preliminary (30%) Level Plan Package
Paving Quality Control Plan	Information	At the pre-paving conference
SMA & HMA mix designs – I-70 Mainline	Information	Condition to the initiation of paving Construction Work
SMA & HMA mix designs – CDOT Roadways and Local Agency Roadways	Acceptance	Condition to the initiation of paving Construction Work
PCCP mix designs – I-70 Mainline	Information	Condition to the initiation of paving Construction Work
PCCP mix designs – CDOT Roadways and Local Agency Roadways	Acceptance	Condition to the initiation of paving Construction Work
Detour pavement mix design	Information	At the pre-paving conference
PCCP Jointing Plan – I-70 Mainline	Acceptance	Condition to the initiation of paving Construction Work
PCCP Jointing Plan – CDOT Roadways and Local Agency Roadways	Acceptance	Condition to the initiation of paving Construction Work

6.8 Appendices

Appendix A Project Special Provisions

Appendix A
Project Special Provisions

The following special provisions supplement or modify and take precedence over the Standard Specifications. The provisions of Appendix A to Schedule 10A Applicable Standards and Specifications apply to these Project Special Provisions.

PROJECT SPECIAL PROVISIONS

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Index	6-6
Revision of Section 105 – Conformity to Roadway Smoothness Category of HMA/SMA	6-7
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Revision of Section 304 – Aggregate Base Course Class 6	6-9
Revision of Section 403 – Hot Mix Asphalt	6-10 to 6-11
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Revision of Section 621 – Detours	6-18

REVISION OF SECTION 105
CONFORMITY TO ROADWAY SMOOTHNESS CATEGORY OF HMA/SMA

Subsection 105.07 of the Standard Specifications is hereby revised as follows:

The incentive/disincentive provision adjustments included in this subsection for pavement smoothness are not applicable.

Delete Table 105-6 and replace with the following table:

Table 105-6A
HMA PAVEMENT SMOOTHNESS (INCHES/MILE)
MEAN ROUGHNESS INDEX

Pavement Smoothness Category	Corrective Work Required
I (Overlay)	MRI > 82.0
II (Full Depth)	MRI > 77.0

REVISION OF SECTION 105
CONFORMITY TO ROADWAY SMOOTHNESS CATEGORY OF PORTLAND CEMENT CONCRETE PAVEMENT

Subsection 105.08 of the Standard Specifications is hereby revised as follows:

The incentive/disincentive provision adjustments included in this subsection for pavement smoothness are not applicable.

Delete Table 105-10 and replace with the following table:

Table 105-10A
PCCP SMOOTHNESS (INCHES/MILE)
MEAN ROUGHNESS INDEX

Pavement Smoothness Category	Corrective Work Required (0.10 mile sections)
II	MRI > 77.0

REVISION OF SECTION 304
AGGREGATE BASE COURSE CLASS 6

Section 304 of the Standard Specifications is hereby revised for this Project as follows:

Subsection 304.02 shall include the following:

Materials for the base course shall be ABC Class 6 as shown in Subsection 703.03.

The ABC Class 6 must meet the gradation requirements and have a resistance value of at least 78 when tested by the Hveem Stabilometer method.

When ABC Class 6 consists of a mixture of reclaimed asphalt and other aggregates, the maximum density shall be determined in accordance with AASHTO T-180, Method A. The field moisture determination for correction to dry density shall be determined by oven or microwave drying. Moisture determination using a nuclear gauge will not be permitted.

REVISION OF SECTION 403
HOT MIX ASPHALT

Section 403 of the Standard Specifications is hereby revised for CDOT Roadways on this Project as follows:

Subsection 403.02 shall include the following:

The design mix for HMA shall conform to the following:

Table 403-1

Property	Test Method	Value for Grading		
		S (100)	SX (100)	Patching
Air Voids, percent at: N (initial) [for information only] N (design)	CPL 5115	 3.5 – 4.5	 3.5 – 4.5	 3.5 – 4.5
Lab Compaction (Revolutions): N (initial) [for information only] N (design)	CPL 5115	 8 100	 8 100	 8 100
Stability, minimum	CPL 5106	30	30	30
Aggregate Retained on the 4.75 mm (No. 4) Sieve with at least 2 Mechanically Induced fractured faces, % minimum	CP 45	70	70	70
Accelerated Moisture Susceptibility Tensile Strength Ratio (Lottman), minimum	CPL 5109 Method B	80	80	80
Minimum Dry Split Tensile Strength, kPa (psi)	CPL 5109 Method B	205 (30)	205 (30)	205 (30)
Grade of Asphalt Cement, Top Layer			PG 76-28	PG 76-28
Grade of Asphalt Cement, Layers below Top		PG 64-22		PG 64-22
Voids in the Mineral Aggregate (VMA) % minimum	CP 48	See Table 403-2	See Table 403-2	See Table 403-2
Voids Filled with Asphalt (VFA), %	AI MS-2	65-75	65-75	65-75
Dust to Asphalt Ratio Fine Gradation Coarse Gradation	CP 50	0.6 – 1.2 0.8 – 1.6	0.6 – 1.2 0.8 – 1.6	0.6 – 1.2 0.8 – 1.6

Notes:

- AI MS-2 = Asphalt Institute Manual Series 2.
- The current version of CPL 5115 is available from the Department.
- Mixes with gradations having less than 40% passing the 4.75 mm (No. 4) sieve shall be approached with caution because of constructability problems.
- Gradations for mixes with a nominal maximum aggregate size of one-inch or larger are considered a coarse gradation if they pass below the maximum density line at the #4 screen.
- Gradations for mixes with a nominal maximum aggregate size of ¾ inch or smaller are considered a coarse gradation if they pass below the maximum density line at the #8 screen.

-2-
REVISION OF SECTION 403
HOT MIX ASPHALT

All Mix Designs shall be run with a gyratory compaction angle of 1.25 degrees and properties must satisfy Table 403-1. Form 43 will establish construction targets for Asphalt Cement and all mix properties at Air Voids up to 1.0% below the Mix Design optimum.

For CDOT Roadways, the Department will establish the production asphalt cement and volumetric targets based on the Contractor's mix design and the relationships shown between the hot mix asphalt mixture volumetric properties and asphalt cement contents on the Form 429. The Department may select a different AC content other than the one shown at optimum on the Contractor's mix design in order to establish the production targets as contained on the Form 43. Historically, Air Voids adjustments typically result in asphalt cement increases from 0.1 to 0.5 percent.

Table 403-2

	Minimum Voids in the Mineral Aggregate (VMA)			
Nominal Maximum Size*, mm (inches)		***Design Air Voids **		
	3.5%	**4.0%**	**4.5%**	**5.0%**
37.5 (1½)	11.6	11.7	11.8	N/A
25.0 (1)	12.6	12.7	12.8	
19.0 (¾)	13.6	13.7	13.8	
12.5 (½)	14.6	14.7	14.8	
9.5 (⅜)	15.6	15.7	15.8	
4.75 (No. 4)	16.6	16.7	16.8	16.9

- * The Nominal Maximum Size is defined as one sieve larger than the first sieve to retain more than 10%.
- ** Interpolate specified VMA values for design air voids between those listed.
- *** Extrapolate specified VMA values for production air voids beyond those listed.

As a part of the Contractor's Quality Management Plan, the Contractor shall outline the steps taken to minimize segregation of HMA. The Quality Management Plan shall define a process by which the Contractor shall address unacceptable segregation, but, at a minimum, the paving shall stop and the cause of segregation shall be corrected before paving operations will be allowed to resume.

Department approved Warm Mix Asphalt (WMA) may be allowed on this project for all other roadways in accordance with CP 59. Unique requirements for WMA design, production and acceptance testing as documented during Department WMA approval shall be submitted and approved prior to creation of the Form 43 and before any WMA production on the project. Delays to the project due to WMA submittal and review will be considered within the Contractor's control and will be non-excusable HMA for patching shall conform to the requirements of the lift being patched. All patching determinations shall be the responsibility of the Contractor with consultation with the Department.

A minimum of 1% hydrated lime by weight of the combined aggregate shall be added to the aggregate for all HMA.

REVISION OF SECTION 401 AND 703
STONE MATRIX ASPHALT PAVEMENT

Sections 401 and 703 of the Standard Specifications are hereby revised for CDOT Roadways on this Project as follows:

Subsection 401.02 shall include the following:

Recycled Asphalt Pavement (RAP) shall not be used in Stone Matrix Asphalt (SMA) mix.

Subsection 401.09 shall include the following:

Each SMA load shall be completely covered and securely fastened with a full tarp.

Subsection 401.16 shall include the following:

The SMA mixture shall be transported and placed on the roadway without drain-down or flushing. All flushed areas behind the paver shall be removed immediately upon discovery. If more than 50 square feet of flushed SMA pavement is ordered removed and replaced in any continuous 500 linear feet of paver width laydown, operations shall be discontinued until the source of the flushing has been found and corrected. The Department shall designate the depth and area of all flushed areas requiring removal and replacement. All costs associated with the removal and replacement of the flushed areas shall be at the Contractor's expense.

Subsection 401.17 shall include the following:

Rollers shall not be used in a vibratory mode on SMA unless they are first used successfully in the demonstration control strip specified in subsection 403.03. Pneumatic wheel rollers shall not be used on SMA mix.

SMA pavement shall be placed and compacted in accordance with the temperatures listed in subsection 401.07 as revised for this Project.

The relative compaction for all SMA mixtures will be measured from roadway cores in accordance with CP 44, Method B, unless the SMA mixture is being placed on a structure (bridge deck) in which case the Department may specify that nuclear gauge measurements be used.

When cores are used, the Contractor shall provide all labor and equipment for the coring operation and filling the core holes. When nuclear density gauges are used, the tests will be performed in accordance with CP 81 and CP 82.

In-place density for SMA shall be 93 to 97% of the SMA mix maximum specific gravity as measured according to CP 51.

Subsection 401.22 shall include the following:

Acceptance, testing, and pay factors for SMA shall be in accordance with subsections 105.05 and 106.05 as revised for this Project for HMA. The specifications for gradation acceptance shall be applied for all SMA placed on the project.

Subsection 703.06 shall include the following:

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REVISION OF SECTION 401 AND 703
STONE MATRIX ASPHALT PAVEMENT

Mineral filler for the SMA pavement shall be limestone dust and shall meet the requirements of this subsection and the following:

Plasticity Index (AASHTO T90) 4% Maximum

The Contractor shall submit hydrometer analysis (AASHTO T88) for the mineral filler used in the SMA mix.

Section 403 of the Standard Specifications is hereby revised for this project as follows:

Subsection 403.01 shall include the following:

This work includes placing a Stone Matrix Asphalt (SMA) pavement as shown on the plans.

Subsection 403.02 shall include the following:

The SMA gradation for this project shall be ½ inch

Mixture design and field control testing of SMA shall be performed using either the SuperPave (CPL 5115, 100 Gyrations) or the Marshall Method (AASHTO T245, 50 Blow).

A minimum of two weeks prior to the proposed use of any Stone Matrix Asphalt pavement on the project, a pre-paving conference will be conducted. At that time, the Contractor shall submit to the Department, a mix design meeting the appropriate specification requirements for one of the following:

The SuperPave SMA mix design shall conform to the requirements of Table 403-1a:

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REVISION OF SECTION 401 AND 703
STONE MATRIX ASPHALT PAVEMENT

Table 403-1a

Property	Test Method	Value for SMA
Air Voids, percent at: N(Design)	CPL 5115	3.0 – 4.0
Lab compaction (Revolutions) N(Design)	CPL 5115	100
Accelerated Moisture Susceptibility, tensile strength Ratio, (Lottman), minimum	CPL 5109, Method B	70
Minimum Dry Split Tensile Strength, psi	CPL 5109, Method B	30
Grade of Asphalt Cement		PG 76-28
Voids in the Mineral Aggregate (VMA) %, minimum	CP 48	17
Draindown at Production Temperature	AASHTO T305	0.3 maximum
% VCA^{1}_{MIX}	AASHTO R 46	Less than VCA_{DRC}[2]

Note: The current version of CPL 5115 is available from the Region Materials Engineer

Note: Copies of AASHTO R 46 and M 325 can be obtained from the Region Materials Engineer

Note: [1]Voids in the Coarse Aggregate

Note: [2]Dry-rodded condition

For CDOT Roadways the Form 43 will establish construction targets for asphalt cement and all mix properties at air voids up to 1.0 percent below the mix design optimum. The Department will establish the production asphalt cement and volumetric targets based on the Contractor's mix design and the relationships shown between the Stone Matrix Asphalt mixture volumetric properties and asphalt cement contents on the Form 429. The Department may select a different AC content other than the one shown at optimum on the Contractor's mix design in order to establish the production targets as contained on the Form 43. Historically, Air Voids adjustments typically result in asphalt cement increases from 0.1 to 0.5 percent. Contractors bidding the project should anticipate this change and factor it into their unit price bid.

The Marshall SMA mix design shall conform to the following:

Mix Properties	Value
Stability, Marshall Compactor	1400 lbs., min
% Voids in Total Mix	3 – 4%
VMA (% Voids in the Mineral Aggregate)	17 min.
Lottman, CPL 5109, Method B	70% min
Dry Tensile Strength, (CPL 5109)	30 psi, min.

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REVISION OF SECTION 401 AND 703
STONE MATRIX ASPHALT PAVEMENT

Regardless of mix design method, a minimum of 1 percent hydrated lime by weight of the combined aggregate shall be added to the aggregate for all Stone Matrix Asphalt.

For CDOT Roadways, the SMA Mix design must be Accepted by the Department before any pavement is placed on the project. In addition, the Contractor shall provide field control testing during production of the SMA mix and for the demonstration control strip. The Contractor shall perform the following tests and provide the results to the Department during production:

If a SuperPave SMA mix design is used, the Contractor shall perform the following tests and provide the results to the Department during production:

Superpave Mix Property	Frequency
Draindown (AASHTO T 305)	1/1000 tons or fraction thereof
Percent Voids in the total mix @ $N_{(design)}$	1/1000 tons or fraction thereof
VMA (Percent Voids in the Mineral Aggregate) @ $N_{(design)}$	1/1000 tons or fraction thereof
Lottman, CPL 5109, Method B	1/5000 tons or fraction thereof
Dry Tensile Strength, CPL 5109	1/5000 tons or fraction thereof
Percent AC & Aggregate Gradation CP 5120	1/1000 tons or fraction thereof

If a Marshall SMA mix design is used, the Contractor shall perform the following tests and provide the results to the Department during production:

Marshall Mix Property	Frequency
Draindown (AASHTO T 305)	1/1000 tons or fraction thereof
Stability (Marshall)	1/1000 tons or fraction thereof
Percent Voids in the total mix	1/1000 tons or fraction thereof
VMA (Percent Voids in the Mineral Aggregate)	1/1000 tons or fraction thereof
Lottman, CPL 5109, Method B	1/5000 tons or fraction thereof
Dry Tensile Strength, CPL 5109	1/5000 tons or fraction thereof
Percent AC & Aggregate Gradation CP 5120	1/1000 tons or fraction thereof

Subsection 403.03 shall include the following:

The mineral filler for SMA shall be stored in a separate silo and added automatically in the correct proportion. The mineral filler addition equipment shall be electronically or mechanically interlocked to the aggregate feed sensors so that the proper amount of mineral filler is added whenever SMA is produced.

The SMA mineral filler shall be added at the same point the asphalt cement is added to the aggregate.

Tack coat between the existing pavement and Stone Matrix Asphalt pavement shall be placed at a rate between 0.03 and 0.05 gallons per square yard.

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REVISION OF SECTION 401 AND 703
STONE MATRIX ASPHALT PAVEMENT

For CDOT Roadways, and before proceeding with SMA placement, the Contractor shall demonstrate the ability to produce and place a satisfactory mix in a Demonstration Control Strip (DCS). The Contractor will coordinate with the Department on the proposed location of the DCS. The DCS shall consist of a minimum quantity of 500 tons placed in one lane, full width. Within the last 200 tons of SMA placed in the DCS, the Contractor and Department shall determine properties (VMA, Voids, in-place density, AC content, gradation, and Marshall Stability, if required) of the project produced SMA mix used in the DCS and provide the results to the Department. The Contractor may proceed with full production if all mixture properties are within the specified tolerances.

To determine the in-place density and roller pattern, one core shall be taken at three random locations within the last 200 tons of the DCS. The Department will determine the coring locations using a stratified random sampling process. The cores shall be immediately submitted to the Department and will be used for determining acceptance of the DCS. Densities of the random samples will be determined by cores according to CP 44. Coring shall be performed by the Contractor under Department observation. Coring will not be measured and paid for separately but shall be included in the work.

The DCS will be designated as a separate process.

REVISION OF SECTION 412
PORTLAND CEMENT CONCRETE PAVEMENT

Section 412 of the Standard Specifications is hereby revised for this project as follows:

Subsection 412.13(b) 1 shall include the following:

> If tie bars are inserted into plastic concrete with a tie bar insertion machine, tie bar location and concrete consolidation shall be subject to the following additional requirements:
>
> Each 2500 linear feet of longitudinal weakened plane joint resulting from the procedure shall have one random location cored where the core intercepts an inserted tie bar. The core shall be six-inch diameter taken in the presence of the Engineer.
>
> If non-consolidated concrete is evident above the inserted tie bar, the Contractor shall cease paving operations and submit a corrective action plan in writing for approval. Correction of the joint and further paving shall take place only after written approval of the corrective action plan has been provided by the Engineer. Additional coring may be required, as directed by the Department. Coring operations, including patching, shall be at the Contractor's expense.
>
> Further failure to consolidate the concrete over the tie-bars will be justification to preclude the use of automatic tie-bar insertion for the remainder of the project.

REVISION OF SECTION 621
DETOURS

Section 621 is hereby added to the Standard Specifications for this Project and shall include:

This work consists of designing and constructing detours for all phases of construction on I-70 Mainline and all applicable side streets; maintenance of the detours; removal of the detours; and removal and replacement of appurtenances required to construct and operate the detours including but not limited to guardrail, curb and gutter, detour pavement, embankment material and unclassified excavations.

The Contractor shall provide a paved surface for all detours. The Contractor shall determine the type and thickness of pavement that shall be used to accommodate the traffic loadings. All materials required for detour shall comply with project standard specifications and special provisions.

The Contractor shall maintain the detour pavement for the entire period that it is open to the traveling public, including all temporary approaches, accesses, crossings, and intersections with adjacent roads and streets. Detour pavements shall be maintained in good operating condition devoid of potholes, uneven surfaces, and rutting. The Department may direct the Contractor to repair or replace detour pavements if, in the Department's sole discretion, detour pavements are determined to be a safety hazard.

The Contractor shall be responsible for quality control required to assure adequate quality of embankment material, aggregate base course, HMA used in the construction of the detour.

The detour locations and dimensions for all phases of construction shall be as shown on the Contractor's plans.

If the materials and thickness furnished for the detour pavement result in an inadequate detour structure, the Contractor will provide additional thickness, materials, or other measures necessary to provide a satisfactory pavement for the life of the detour. These additional improvements shall be furnished at no additional cost. All necessary signs, pavement markings and other traffic control devices shall be provided in accordance with the Contractor's Traffic Control Plan.

The finished transverse and longitudinal surface elevation of any detour or patch shall be measured using a 10 foot straightedge. Areas to be measured will be directed by the Department. The Contractor shall furnish an approved 10 foot straightedge, depth gauge and operator to aid the Department in testing the pavement surface. Areas showing high spots of more than 1/2 inch in 10 feet shall be marked and diamond ground until the high spot does not exceed 1/2 inch in 10 feet.

The Contractor shall maintain the detour for the entire period that it is open to traffic. Any distress, in the Department's opinion, that affects the ride, safety, or serviceability of the detour roadway shall be corrected to the satisfaction of the Department at the expense of the Contractor.

The Contractor shall be responsible for the complete removal and disposal of all temporary detour pavement prior to Substantial Completion.

7. EARTHWORK

7.1 Applicable Standards

All Construction Work required to be performed by the Developer pursuant to this Section shall comply with the Construction Standards, the relevant requirements listed in this Section, and Good Industry Practice.

7.2 Clearing and Grubbing

7.2.1 The Developer shall be responsible for all clearing and grubbing and earthwork requirements for the Construction Work.

7.2.2 The Developer shall be responsible for clearing and grubbing including, without limitation, the removal of trees, logs, stumps, brush, trash, etc. from the Site prior to the start of any Construction Work and shall comply with any additional requirements for the affected area in accordance with Schedule 17 Environmental Requirements.

7.2.3 The Developer shall conduct a pre-clear and grub meeting with the Department prior to the start of any Construction Work to agree to the limits of clearing and grubbing, removal, replacement, or transplanting of any trees and shrubs.

7.2.4 The Developer shall include clearing and grubbing limits as part of each design submittal for all Construction Work in that area. Such submittals shall include provisions for the removal, replacement or transplanting of any trees.

7.3 Material Requirements

7.3.1 All Construction Work shall be conducted in accordance with the CDOT *Pavement Design Manual* and the CDOT *Field Materials Manual* unless otherwise specified in this Section.

7.3.2 Unless otherwise specified in this Section, the Developer may use on-Site materials for subgrade on the Project provided that it can be demonstrated by tests that they comply with the material property requirements included in Section 203 of the CDOT Standard Specifications. Such test data shall be submitted to the Department for Information prior to use of the material on the Project.

7.3.3 Materials acquired from on-Site excavations and subsequently used in embankments on the Project shall have a minimum R-Value of 20 when placed (a) within the first three feet below the surface within the I-70 Mainline part of the Ultimate configuration roadway prism and (b) anywhere, regardless of depth, within any other part of the Ultimate configuration roadway prism, including any CDOT Roadway or Local Agency Roadway All compaction shall be in accordance with Section 203 of the CDOT Standard Specifications.

7.3.4 Preliminary subsurface investigations are included in the Reference Documents. The Developer shall conduct a supplemental soil survey to confirm/ascertain whether the existing roadway soil satisfies the material requirements of this Section if it is desired to re-use this soil in the roadway prism. If the existing roadway soils are re-used, the material will be tested as stated in the CDOT *Field Materials Manual* during construction. This supplemental soil survey shall conform to the requirements as stated in the 2016 CDOT *Field Materials Manual*. Test holes are required at a minimum of 1,000 feet. The Developer shall provide any additional mitigation required as a result of the supplemental soil survey.

7.3.5 The results of any supplemental soil surveys conducted by the Developer together with any proposed mitigation measures to address matters identified in the surveys shall be submitted to the Department for Information before any pavement and pavement-related work commences. Such information shall be submitted in a report format that clearly and concisely describes the existing soil conditions, delineates areas needing mitigation, and defines the mitigation measures. The report shall include a soil profile, boring log, and the test results.

7.3.6 Alternative subgrade treatment proposals shall be submitted to the Department for Acceptance prior to incorporation into the Construction Work. Locations where any alternative subgrade treatments are utilized on the Project shall be shown on the As-Built documents.

7.3.7 The Developer shall be responsible for identifying sources of material required for the Project.

7.3.8 The Developer shall be responsible for disposing of all surplus material off-Site. The Developer may dispose of some surplus material at locations as identified by CCD. Refer to Section 4.D of the Denver IGA and the Guidance for Central 70 Project Reuse of Excess Soil on City and County of Denver Owned Properties memorandum provided in the Reference Documents.

7.4 CDOT Roadways

7.4.1 The subgrade on the CDOT Roadways shall consist of a minimum of six inches of Aggregate Base Course (ABC) Class 6 and be underlain by at least 24 inches of material with an R-value greater than or equal to 20. Soil in the zone one foot beneath the R-20 material shall be treated in accordance with Section 203 of the CDOT Standards Specifications.

7.4.2 Subgrade on CDOT Roadways shall have a percent swell less than or equal to one to a depth of three feet below the bottom of the proposed ABC Class 6 as determined by ASTM D-4546. A percent swell less than or equal to one corresponds to a low probable swell damage risk. Swell tests are required on A-4, A-5, A-6 and A-7-6 soils to verify the percent swell of the existing soil is less than or equal to one percent. If the swell index is greater than one percent, mitigation is required to a minimum depth of three feet below the base of the proposed ABC Class 6. The Developer shall demonstrate that any proposed mitigation measures will result in one percent swell less than or equal to one percent when tested with a 200 psf surcharge pursuant to ASTM D-4546.

7.5 Local Agency Roadways

The subgrade on Local Agency Roadways shall meet the minimum resistance values (R-value, k-value, classification) as specified by the Local Agency.

7.6 Compaction Requirements

7.6.1 Depth of moisture-density control shall be as follows:

a. Full depth of all embankments;

b. Six inches for bases of cuts and fills; and

c. 12 inches underneath the proposed pavement section (pavement/base course).

7.6.2 In-place density/percent relative compaction testing frequency for 203 embankment shall be conducted in accordance with the CDOT *Field Materials Manual,* except that, for 203 embankment material that is required for the backfill of a trench made for any pipe or utility installation, the Developer shall test each lift at least every 200 linear feet, at least once for every 25 cubic yards of backfill, or at least once per day. Pipes or utilities that require less than 200 feet of trench or less than 25 cubic yards of 203 embankment backfill will require at least one compaction and moisture test per lift.

7.7 Reuse of Materials

7.7.1 Aggregate Base Course (Class 6) may include broken, crushed or milled asphalt and shall meet the material and gradation requirements of Subsection 703.03. No more than 80% of the material, by weight, may be reclaimed asphalt pavement (RAP) meeting the requirements of Aggregate Base Course (RAP) as specified in Schedule 10A Applicable Standards and Specifications (Revision of Sections 304 and 703). When ABC (RAP) is used as base course it shall not be allowed under HMA.

7.7.2 The existing subgrade will be allowed to remain in-place if it meets the requirements listed previously.

7.7.3 The Developer shall not excavate or remove any material from within the roadway, which is not within the grading limits, as indicated by the slope and grade lines.

7.8 Geotextiles

7.8.1 The Developer shall include as part of its pavement design submittals the locations where geotextile installation is proposed. The geotextile shall be installed in accordance with manufacturer's recommendations.

7.8.2 Geotextiles shall meet the requirements for Geotextile Class I (per American Association of State and Highway Officials (AASHTO) M 288) and be approved for stabilization and separation applications.

7.9 Deliverables

7.9.1 At a minimum, the Developer shall submit the following to the Department for Information, Acceptance, or Approval in accordance with the specified timeframes:

Table 7-1 Deliverables

Deliverable	Information, Acceptance, or Approval	Schedule
Results of supplemental soil survey along with any proposed mitigation measures	Information	Before any embankment, aggregate base course, pavement and pavement-related Construction Work commences
Alternative subgrade treatments	Acceptance	Before any embankment, aggregate base course, pavement and pavement-related Construction Work commences
Locations requiring geotextile installation	Information	Submitted with pavement mix designs

8. DRAINAGE

8.1. General

8.1.1. The Developer shall be responsible for the design, installation and construction of all drainage systems and outfalls required for the Construction Work. The Construction Work shall comply with the CDOT and Local Agency Municipal Separate Storm Sewer System (MS4) Permits where applicable.

8.1.2. The Developer shall obtain necessary Temporary Easements, Permits and Additional ROW Parcels prior to the Construction Work and shall not adversely impact property owners outside the Site.

8.1.3. The Developer shall:

a. Design, install, and construct a complete storm drainage system to intercept and remove surface runoff from the I-70 Mainline, CDOT Roadways and Local Agency Roadways;

b. Maintain surface, channel, and conduit flow through the Right-of-Way and Additional Right-of-Way; and

c. Be responsible for drainage-related hazards within and outside the Site, public inconvenience, flood damages, and water quality impacts caused by Construction Work during the Construction Period.

8.1.4. For reference only, the Master Plan Drainage Report and Master Plan Water Quality Report are provided as Reference Documents. The reports provide concepts for Offsite and Onsite drainage design, detention and general location for permanent water quality features.

8.2. Applicable Standards

All Construction Work required to be performed by the Developer pursuant to this Section shall comply with the Construction Standards, the relevant requirements listed in this Section 8, and Good Industry Practice.

8.2.1. Software

The Developer shall use the following software in performing drainage design calculations:

a. CUHP/EPA-SWMM;

b. USACE, HEC-RAS;

c. FHWA, HY-8;

d. InRoads Storm and Sanitary; and

e. FLO-2D.

8.3. Administrative Requirements

8.3.1. Local Agency Roadways

The Developer shall submit plans, reports and applicable Governmental Approvals directly to the Local Agencies as part of the deliverable process. Design, construction and installation shall conform to Local Agency requirements and standards for areas of the Project outside CDOT Right-of-Way.

8.3.2. Coordination with Other Agencies

a. The Department has coordinated with City of Denver (CCD) and Urban Drainage and Flood Control District (UDFCD) for design flows from the Montclair and Park Hill Basins. For reference only, these reports are provided as Reference Documents.

b. The Developer shall coordinate all drainage related issues with affected Governmental Authorities. The Developer shall include the Department in all correspondence with the appropriate Governmental Authorities.

c. The Developer shall coordinate all drainage related issues, as related to Construction Work on Railroad right-of-way, with the affected Railroad. The Developer shall obtain all required Permits, as described in Schedule 18 Right-of-Way and Section 8.4 of the Project Agreement.

8.3.3. Permits

Pursuant to Section 8.4.1.a of the Project Agreement, the Developer shall obtain and comply with the requirements of the Environmental Approvals and other Permits, including stormwater Permits that are necessary for the Construction Work. Without limiting its obligations under such Section 8.4.1.a, the Developer is obligated to adhere to the following requirements as they may be amended or superseded pursuant to Law:

a. Colorado Discharge Permit System-Stormwater Construction Permit

The Developer shall be responsible for obtaining the Colorado Discharge Permit System-Stormwater Construction Permit (CDPS-SCP) and shall comply with all stormwater Permit requirements until final stabilization has been achieved and until the CDPS-SCP Permit can be closed. This includes the maintenance of all Best Management Practices (BMPs), maintenance of all seeded/landscaped areas, and removal of all Best Management Practices (BMPs) once all erosion potential has been eliminated.

b. Storm Water Management Plan

The Developer's Stormwater Management Plan (SWMP) is required to fulfill the requirements of the CDPS-SCP and shall follow the format of the CDOT SWMP template.

c. Best Management Practices

BMPs are required to fulfill the requirements of the SWMP. The Developer shall design, install and maintain construction BMPs for the Construction Work in accordance with the CDOT *Erosion Control and Stormwater Quality Guide*.

d. CDOT New Development Redevelopment Interim Program Guidance

The New Development Redevelopment Program (NDRD), also referred to as the CDOT Permanent Water Quality (PWQ) Program, is required under CDOT's MS4 Permit. The Developer shall comply with the most current version of the NDRD Interim Program Guidance for areas within the CDOT MS4 boundary.

i. The Developer shall install Permanent Stormwater Quality Facilities (PSQFs) in accordance with the CDOT *Erosion Control and Stormwater Quality Guide* and the UDFCD *Urban Storm Drainage Criteria Manual*;

ii. Storm runoff from the Site is tributary to the South Platte River which is classified as a 303d impaired stream. A figure is included in the Master Plan Water Quality Report that describes each stream segment. For reference only, this figure is provided in the Reference Documents;

iii. Runoff from impervious areas outside ROW shall follow the Local Agency MS4 Permit for any required PSQFs;

iv. In areas where runoff crosses MS4 boundaries, the more stringent MS4 requirements shall apply for the design of PSQFs;

v. The use of equivalent areas within the CDOT MS4 boundary shall reside within the tributary area of each 303d stream segment. All equivalent area designations shall be submitted to the Department for Approval. The Department will require PSQFs for runoff generated from 100% of the impervious area tributary to the Lowered Section. Equivalent areas accounting for the Lowered Section elsewhere in the Project will not be allowed; and

vi. A figure has been provided in the Master Plan Water Quality Report that delineates the preliminary MS4 boundaries for the Project. The Developer shall be responsible for delineating the final limits of the MS4 boundaries. For reference only, this figure is provided in the Reference Documents.

e. US Army Corps of Engineers Permit

The Developer shall be responsible for portions of the storm drainage system that are subject to Permitting under Section 404 of the Clean Water Act. Refer to Schedule 17 Environmental Requirements for additional requirements.

f. Colorado Senate Bill 40 Permit

The Developer shall be responsible for portions of the storm drainage system that are subject to Permitting under Colorado Senate Bill (SB) 40. Refer to Schedule 17 Environmental Requirements for additional requirements.

g. Groundwater Permits

The Developer shall be responsible for Permit requirements associated with dewatering for both the Construction Period and the Operating Period. Permits required may include construction dewatering discharge permits, remediation activities discharge permits, or subterranean groundwater permits or well development permits. The Permits shall remain the responsibility of the Developer following Substantial Completion. Refer to Schedule 17 Environmental Requirements for additional requirements.

h. City and County of Denver Permit Requirements

The Developer shall comply with the most current version of the Denver MS4 Permit. The Denver MS4 Permit applies only to areas within the Denver MS4 boundary. The Developer shall

i. Comply with the CCD Ultra-Urban Green Infrastructure Guidelines for areas inside the CCD MS4 boundary within the Project. The use of these guidelines shall be approved by CCD for applicability with Denver MS4 requirements;

ii. Comply with the CCD Storm Criteria Manual for water quality; and

iii. Restore existing water quality facilities impacted by Construction Work per CCD Storm Criteria Manual and CCD Construction Activities Stormwater Discharge Permit requirements.

8.4. Design Requirements

8.4.1. Data Collection

a. The Developer is solely responsible for obtaining all relevant storm drainage improvement plans, drainage planning studies, and drainage reports for the Construction Work;

b. The Developer is solely responsible for obtaining existing and future land use information from all Local Agencies and shall design facilities to be compatible with drainage systems, existing or proposed, on adjacent properties with no adverse impacts. The Developer shall utilize the most current land use information at the time of the Setting Date;

c. For reference only, certain drainage structure surveys are provided in the Reference Documents; and

d. The Developer shall perform such detailed mapping and surveys as it determines necessary to verify locations of existing drainage and Utility features necessary for the proposed drainage design. The Developer shall verify or identify boundaries, flow patterns, and land use of drainage basins based on field observations.

8.4.2. Ultimate Design

The Developer shall design and construct all drainage facilities to the Ultimate design from Brighton Boulevard to Sand Creek. The Developer shall design and construct all ponds for the Ultimate design from Sand Creek to Chambers Road. All other drainage facilities, between Sand Creek and Chambers Road, shall be designed and constructed to accommodate the Project.

8.4.3. Surface Hydrology

The Developer shall perform hydrologic analyses for all Onsite and Offsite drainage basins that are adjacent to and contribute runoff to the Site. The analysis shall be based on future land use information and the Ultimate design. The hydrologic analyses shall not adversely impact the existing drainage systems outside the Site area

a. Design Frequencies

For the I-70 Mainline and CDOT Roadways, the design frequency for the minor and major storm shall be the 10 and 100 year event, respectively.

b. Precipitation

The Developer shall design all drainage elements using the precipitation data given in Tables 8-1, 8-2 and 8-3 provided that such data establishes the minimum design criteria for such elements and the use thereof does not relieve the Developer of any risks, responsibilities or liabilities that it otherwise assumes pursuant to the Project Agreement (including in relation to the risk of flooding).

Table 8-1 Intensity-Duration Frequency Data (in/hr)

Frequency	5 min	10 min	15 min	30 min	60 min
2 year	3.22	2.57	2.16	1.49	0.95
5 year	4.55	3.63	3.04	2.10	1.34
10 year	5.26	4.19	3.52	2.43	1.55
50 year	7.63	6.09	5.11	3.53	2.25
100 year	8.72	6.95	5.83	4.03	2.57

Table 8-2 Incremental Rainfall Depth/Return Period (in)

Time (min)	Basins less than 5 sq. miles					Basins between 5 and 10 sq. miles					Basins between 10 and 20 sq. miles				
	2 yr	5 yr	10 yr	50 yr	100 yr	2 yr	5 yr	10 yr	50 yr	100 yr	2 yr	5 yr	10 yr	50 yr	100 yr
5	0.02	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.03	0.03
10	0.04	0.05	0.06	0.08	0.08	0.04	0.05	0.06	0.08	0.08	0.04	0.05	0.06	0.08	0.08
15	0.08	0.12	0.13	0.11	0.12	0.08	0.11	0.12	0.11	0.12	0.08	0.12	0.13	0.11	0.12
20	0.15	0.21	0.23	0.18	0.21	0.13	0.18	0.20	0.18	0.21	0.15	0.21	0.23	0.18	0.21
25	0.24	0.34	0.39	0.34	0.36	0.20	0.29	0.33	0.34	0.36	0.23	0.34	0.39	0.34	0.36
30	0.13	0.17	0.19	0.56	0.64	0.11	0.15	0.16	0.56	0.64	0.13	0.17	0.19	0.56	0.64
35	0.06	0.08	0.09	0.27	0.36	0.06	0.08	0.08	0.27	0.36	0.06	0.08	0.09	0.27	0.36
40	0.05	0.06	0.07	0.18	0.21	0.05	0.06	0.06	0.18	0.21	0.05	0.06	0.07	0.18	0.21

Time (min)	Basins less than 5 sq. miles					Basins between 5 and 10 sq. miles					Basins between 10 and 20 sq. miles				
	2 yr	5 yr	10 yr	50 yr	100 yr	2 yr	5 yr	10 yr	50 yr	100 yr	2 yr	5 yr	10 yr	50 yr	100 yr
45	0.03	0.05	0.06	0.11	0.16	0.03	0.05	0.06	0.11	0.16	0.03	0.05	0.06	0.11	0.16
50	0.03	0.05	0.05	0.11	0.13	0.03	0.05	0.05	0.11	0.13	0.03	0.05	0.05	0.11	0.13
55	0.03	0.04	0.05	0.07	0.10	0.03	0.04	0.05	0.07	0.10	0.03	0.04	0.05	0.07	0.10
60	0.03	0.04	0.05	0.07	0.10	0.03	0.04	0.05	0.07	0.10	0.03	0.04	0.05	0.07	0.10
65	0.03	0.04	0.05	0.07	0.10	0.03	0.04	0.05	0.07	0.10	0.03	0.04	0.05	0.07	0.10
70	0.02	0.04	0.05	0.05	0.05	0.02	0.04	0.05	0.05	0.05	0.02	0.04	0.05	0.05	0.05
75	0.02	0.03	0.05	0.05	0.05	0.02	0.03	0.05	0.05	0.05	0.02	0.03	0.05	0.05	0.05
80	0.02	0.03	0.04	0.04	0.03	0.02	0.03	0.04	0.04	0.03	0.02	0.03	0.04	0.04	0.03
85	0.02	0.03	0.03	0.04	0.03	0.02	0.03	0.03	0.04	0.03	0.02	0.03	0.03	0.04	0.03
90	0.02	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.03	0.03
95	0.02	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.03	0.03
100	0.02	0.02	0.03	0.03	0.03	0.02	0.02	0.03	0.03	0.03	0.02	0.02	0.03	0.03	0.03
105	0.02	0.02	0.03	0.03	0.03	0.02	0.02	0.03	0.03	0.03	0.02	0.02	0.03	0.03	0.03
110	0.02	0.02	0.03	0.03	0.03	0.02	0.02	0.03	0.03	0.03	0.02	0.02	0.03	0.03	0.03
115	0.01	0.02	0.03	0.03	0.03	0.01	0.02	0.03	0.03	0.03	0.02	0.02	0.03	0.03	0.03
120	0.01	0.02	0.02	0.03	0.03	0.01	0.02	0.02	0.03	0.03	0.01	0.02	0.02	0.03	0.03
125											0.01	0.01	0.02	0.02	0.01
130											0.01	0.01	0.02	0.02	0.01
135											0.01	0.01	0.02	0.02	0.01
140											0.01	0.01	0.02	0.02	0.01
145											0.01	0.01	0.02	0.02	0.01
150											0.01	0.01	0.02	0.02	0.01
155											0.01	0.01	0.02	0.02	0.01
160											0.01	0.01	0.02	0.02	0.01
165											0.01	0.01	0.02	0.02	0.01
170											0.01	0.01	0.02	0.02	0.01
175											0.01	0.01	0.02	0.02	0.01
180											0.01	0.01	0.02	0.02	0.01
	1.10	1.55	1.79	2.60	2.97	1.02	1.44	1.67	2.60	2.97	1.25	1.72	2.01	2.78	3.14

Table 8-3 One-Hour Point Rainfall (in)

2 Year	5 Year	10 Year	50 Year	100 Year
0.95	1.34	1.55	2.25	2.57

c. Hydrologic Methods

i. The Developer shall perform the necessary hydrologic analyses using the following methods:

A. Areas less than 90 acres shall be evaluated using the rational method. The minimum time of concentration shall be 5 minutes;

B. Areas between 90 and 160 acres shall be analyzed using the Colorado Urban Hydrograph Procedure/Environmental Protection Agency Storm Water Management Model (CUHP/EPA-SWMM) procedure for peak flow only;

C. Areas greater than 160 acres shall be evaluated using the CUHP/EPA-SWMM procedure; and

D. The area draining to the Lowered Section shall use the CUHP/EPA-SWMM procedure for peak flow only.

ii. The hydrologic analyses shall be based on fully developed conditions and the Ultimate design.

8.4.4. Hydraulic Structures

a. Roadways

i. Roadway component geometric configurations shall be designed to provide positive drainage to prevent hydroplaning and roadway icing. Cross slopes shall be designed and constructed in accordance with the requirements of Schedule 10, Section 9 Roadway.

A. Roadway Profile

Longitudinal grades shall be designed and constructed in accordance with the requirements of Schedule 10, Section 9 Roadway.

B. Allowable Flow Spreads

The Developer shall design all required Storm Drain systems to meet the allowable spread criteria given in Table 8-4.

Table 8-4 Roadway Storm Drain Design Frequency and Allowable Spread Criteria

Road Classification		Design Frequency	Allowable Spread into Travel Lane
I-70 Mainline		10 year	0 feet
		100 year	4 feet
I-70 Mainline Entrance/Exit Ramps	< or = 45 mph	10 year	3 feet
	< or = 45 mph	100 year	Half of adjacent travel lane

and	> 45 mph	10 year	0 feet
CDOT Roadways	> 45 mph	100 year	4 feet
Local Agency Roadway		Local Agency Criteria	

C. Edge Treatment

In areas where the roadway pavement discharges runoff to Type 7 Guardrail, Type 3 Guardrail with curb, or at the end of curb returns, flows shall be collected and piped to the toe of the embankment slope. CDOT standard Type 3 Embankment Protectors or inlets shall be used at these locations. Erosion protection shall be constructed at all outfalls.

D. Roadside Ditches and Open Channels

(I) For roadside ditches along all existing and proposed roadways, the water surface profile shall have a minimum of one foot of freeboard for the 10 year return frequency peak discharge and shall not exceed edge of pavement for the 100 year return frequency peak discharge;

(II) All open channels within the Site shall be designed to capture and convey the 100 year return frequency with a minimum one foot of freeboard. Capacity shall be determined using manning's equation;

(III) All ditches and open channels with a grade exceeding two percent shall be constructed with a turf reinforcement mat or other means. Concrete or asphalt lining shall be considered in areas determined by the Developer as difficult to maintain regardless of slope or capacity; and

(IV) Flexible channel linings shall be designed in accordance with Federal Highway Administration (FHWA) *HEC-15, Design of Roadside Channels with Flexible Linings*. Riprap channel lining shall be designed in accordance with FHWA *HEC-23, Bridge Scour and Stream Instability Countermeasures*.

(V) CDOT *M & S Standard Plans* Gutter Type 2 shall be installed behind walls or barrier retaining fill. A minimum of 6 inches shall be maintained between the top of wall or barrier and flowline of gutter. Gutter is not required behind walls at pond locations that accept sheet flow.

ii. Removals and Abandonments

Existing Cross Drains, Storm Drains, embankment protectors and drainage appurtenances between Brighton Boulevard and Sand Creek shall be removed in their entirety and replaced with drainage features designed for the Project. The limits of removal shall be limited to I-70 Mainline, CDOT Roadways, 46th Avenue North, 46th Avenue South, Stapleton Drive North and Stapleton Drive South.

Drains abandoned by the Developer outside the aforementioned removal limits shall be plugged and flow filled per CDOT Standard Specifications and submitted to the Department for Approval prior to abandonment.

Existing drainage features that otherwise meet or exceed the applicable design criteria pursuant to this Section, or that are in such a condition that they will continue to be structurally functional throughout the Operating Period and

otherwise would meet the applicable Handback Requirements, may be retained and reused subject to the Department's prior Approval.

The Developer shall:

A. Maintain historic flow patterns; and

B. Design and construct for the Ultimate design, as described in the Section.

iii. Cross Drains

A. Cross Drains are pipes or culverts that convey water from one side of the road to the other without interruption. Pipes connected to manholes or inlets placed in line with a Cross Drain will be referred to as a Storm Drain for the purposes of the Project Agreement. Unintended detention storage shall not be used to reduce the size of a Cross Drain;

B. Horizontal and vertical alignment of Cross Drains shall be straight with no grade breaks or bends;

C. Cross Drains shall be designed to cause no adverse impacts to existing conditions for properties outside the Site.

D. The Developer shall provide positive drainage to Cross Drain locations;

E. The use of sag pipes or inverted siphons shall not be allowed to convey stormwater;

F. All Cross Drains shall be designed for the 100 year return frequency peak discharge with no overtopping of the I-70 Mainline. The Developer shall refer to this Section in regards to Ultimate design. Hydraulic design of Cross Drains shall be based on the procedures included in FHWA *HDS No. 5, Hydraulic Design of Highway Culverts*;

G. The minimum allowable pipe size for Cross Drains shall be 18 inches. End sections, or headwalls with beveled edges and wingwalls, shall be provided for all Cross Drains regardless of size. To reduce sizes improved inlets may be utilized. Improved inlets shall be designed based on FHWA *HDS-5, Hydraulic Design of Highway Culverts*;

H. Allowable headwater elevation for the 100 year return frequency peak discharge shall be designed as described in the CDOT *Drainage Design Manual*; and

I. The Developer shall account for the effects of seepage velocity and erosion along Cross Drains installed in areas of high or fluctuating groundwater tables as described in the CDOT *Drainage Design Manual*.

iv. Storm Drains

A. Storm Drains shall be defined as a network of pipes that connects inlets, manholes, and other drainage features to an outfall. Cross Drains connected to a Storm Drain system are considered Storm Drains for the purposes of the Project Agreement. Unintended detention storage shall not be used to reduce the size of a Storm Drain;

B. Horizontal and vertical alignment of Storm Drains shall be straight with no grade breaks or bends;

C. The Developer shall provide positive drainage to Storm Drain locations;

D. At locations where 100 year detention is to be provided, the Storm Drain system shall capture and convey the 100 year flows to the detention pond.

E. Hydraulic analyses and plans for Storm Drains that are connected to existing systems upstream or downstream of the Project shall be coordinated with affected Local Agencies. The hydraulic analyses shall cause no adverse impacts to the existing Storm Drain systems caused by the connections and proposed combined peak-design discharges for the overall systems; and

F. The Developer shall account for the effects of seepage velocity and erosion along Storm Drains installed in areas of high or fluctuating groundwater tables as described in the CDOT *Drainage Design Manual*.

v. The minimum allowable diameter for any pipe in a Storm Drain system shall be 18 inches. The Developer shall not decrease Storm Drain size in the downstream direction.

A. Hydraulic Design of Storm Drains

(I) Storm Drain design shall be performed using hydraulic gradient analysis to account for all friction and minor losses. Friction losses shall be calculated using manning's equation. Minor losses at junctions, manholes, bends, and other appurtenances shall be calculated based on design procedures in the FHWA *HEC-22, Urban Drainage Design Manual*;

(II) Storm Drains under the I-70 Mainline shall be designed under free flow conditions for the 10 year return frequency peak discharge for Ultimate design. The hydraulic gradient for the 100 year return frequency shall be below top of pavement, inlet, grate, or manhole lid for the Ultimate design; and

(III) The velocity of flow for Storm Drains shall not be less than three feet per second for the minor storm discharge (10 year) return frequency peak discharge and shall not be greater than 22 feet per second for the major storm discharge (100 year).

B. Inlets

(I) Inlets are required at locations to collect runoff within the design controls specified in this Section. In addition, there are a number of locations where inlets may be necessary with little regard to contributing drainage area. These locations shall be designated on the plans prior to computations regarding discharge, water spread, inlet capacity, or bypass. Examples of such locations can be found in Chapter 13.4.2 of the CDOT *Drainage Design Manual*;

(II) CDOT *M & S Standard Plans* inlets shall be used on all CDOT Roadways.

(III) The following criteria apply to inlets

(aa) Type C and Type D inlets shall not be allowed within the roadway pavement limits unless used in conjunction with embankment protectors;

(bb) Vane grate inlets shall be used in the shoulders of I-70 Mainline and shall not extend into adjacent travel lanes;

(cc) Close mesh grates shall be used for Type C and D inlets near pedestrian areas;

(dd) Concrete aprons shall be installed on Type C and D inlets; and

(ee) Type 13 or Type C inlets shall be used in conjunction with valley pans;

(IV) Inlet hydraulic efficiency and spacing shall be determined based on design procedures in the FHWA *HEC-22, Urban Drainage Design Manual*. One hundred percent of the bypass flow shall be added to the next downstream inlet;

(V) For a continuous Storm Drain system, maximum inlet spacing shall be designed based on allowable flow spread or the manhole spacing criteria, whichever is less;

(VI) The sag vertical curve or sump area on a roadway requires an inlet at the lowest point and flanking inlets on each side of the lowest inlet to provide relief from debris clogging. Inlets shall be located such that the design criteria for spread are maintained;

(VII) Inlets are required 10 feet upstream from the point where the street cross slope begins to super-elevate toward the opposite side to minimize cross street flow. Bypass flow across the I-70 Mainline shall be limited to 0.1 cfs or less. Sump inlets shall not be placed at the zero point of the superelevation transition;

(VIII) Inlets are required at the upstream ends of the Cover along I-70 Mainline. Bypass flow shall be limited to 0.1 cfs or less under the Cover.

(IX) Trench drains will not be allowed in the traveled way or transverse to traffic flow on the I-70 Mainline;

(X) Inlets and inlet aprons shall not be located in the travel lanes of the I-70 Mainline or CDOT Roadways; and

(XI) A clogging factor of 50 percent shall be used for sizing single-unit inlet grates. A clogging factor of 10 percent shall be used for sizing single-unit curb opening inlets. For multiple-unit inlets, the clogging factor may be reduced as recommended in the UDFCD *Urban Storm Drainage Criteria Manual, Volume I*, Chapter 6, Section 3.

C. Manholes and Junction Structures

(I) Manholes shall be incorporated into the Storm Drain system to provide access for inspection, cleaning, and other maintenance activities. Manholes shall be constructed at all junctions, changes in pipe size, drops, and grade changes. Manholes shall be provided at any change in horizontal alignment greater than two degrees. Manholes shall not be located in the wheel path of CDOT Roadways or travel lanes of the I-70 Mainline;

(II) A lateral that is less than half inside diameter of the trunkline and no more than 75 feet long may be connected to the trunkline with a prefabricated pipe wye, tee connection, or by penetration in conjunction with a concrete collar. Larger laterals shall be connected to the trunkline with a manhole;

(III) The spacing of manholes shall be in accordance with the criteria identified in the CDOT *Drainage Design Manual*;

(IV) Manhole and junction structure floors shall be shaped to fit the pipe inverts; and

(V) Pipe connections to manholes with material other than concrete shall be submitted to the Department for Information.

b. Drain Outfalls

i. Cross Drain and Storm Drain outfalls shall be designed such that the outlet elevation matches the receiving drainageway flowline. Outfalls shall be oriented in a downstream direction and designed to minimize existing habitat disturbances during construction;

ii. Permanent erosion protection shall be provided at all outfalls and along the drainage flowlines where needed. Energy dissipaters shall be designed in accordance with the FHWA *HEC-14 Hydraulic Design of Energy Dissipaters for Culverts and Channels*, or UDFCD *Design of Low Tailwater Riprap Basins for Storm Sewer Pipe Outlets;*

iii. All drain outfalls require either a headwall or end section. End sections or headwalls shall be used for drains 48 inches and smaller. A headwall shall be used for any drain 54 inches and larger. A concrete apron shall be required when wingwalls are utilized with a headwall. Saddle headwalls shall not be used. Concrete pipe joint fasteners for end sections shall be installed so that a minimum of 15 linear feet of the outlet end of the pipe are mechanically locked together;

iv. The effect of tailwater in the receiving drainageway on the hydraulics of the outfall shall be evaluated to ensure no adverse impacts. The design frequency of the tailwater of the receiving drainageway shall be based on the comparison of design discharge frequencies for coincidental occurrence included in the FHWA *HEC-22, Urban Drainage Design Manual*; and

v. The Developer shall design and be responsible for obtaining maintenance eligibility from the UDFCD for drain outfalls to major drainageways.

c. Scour and Erosion Control

i. All existing scour, rill or erosion issues within the Site shall be repaired by the Developer;

ii. The Developer shall analyze the I-270 over I-70 proposed structure (E-17-AFS) for erosion and scour potential of Sand Creek and design and construct appropriate protection or mitigation per, HEC-18, *Evaluating Scour at Bridges,* HEC-20*, Stream Stability at Highway Structures* and HEC-23*, Bridge Scour and Stream Instability Countermeasures Experience, Selection, and Design Guidance, Volume 1 and 2*;

iii. The following criteria apply to riprap layer thickness:

A. Thickness shall not be less than the spherical diameter of the D100 stone or less than two times the spherical diameter of the D50 stone, whichever results in the greater thickness;

B. Thickness shall not be less than 12 inches for practical placement;

C. The thickness determined by either criteria A or B shall be increased by 50 percent where the riprap is placed underwater; and

D. Oversized stones not meeting the required D50 gradation shall not be used to achieve required riprap thickness;

iv. Geotextile (Erosion Control Class 1) shall be used under all riprap per CDOT *M & S Standard Plans*.

d. Temporary Drainage during Construction

i. The Developer shall be responsible for the design and construction of temporary drainage of the Site during the Construction Period. Temporary drainage shall comply with Project clear zone requirements. Temporary drainage shall be designed to minimize hydroplaning and icing for each phase or stage of construction;

ii. The minimum size for temporary Storm Drains and Cross Drains shall be 12 inches. The minimum size of temporary underdrains shall be 4 inches. The Developer shall be responsible for selection of material type for temporary drainage features; and

iii. The Developer shall submit Temporary Drainage Plans to the Department for Acceptance in accordance with this Section.

e. Sub-Drainage Systems

i. Sub-drainage systems (e.g., underdrains) shall be designed in accordance with the CDOT *Drainage Design Manual*. Sub-drainage systems may be discharged to the stormwater system in compliance with regulations for groundwater discharge and control of water quality. The Developer shall preserve the capacities and functionality of existing underdrains encountered during construction;

ii. Groundwater is anticipated to be encountered during the Construction Period. For reference only, the Preliminary Subsurface Investigation is provided in the Reference Documents;

iii. The Developer shall be responsible for determining the effects of buoyancy for any roadway or drain under the groundwater table and providing the necessary analysis and design to mitigate its effect for both the Construction Period and the Operating Period;

iv. The Developer shall be responsible for the design, construction (or, as otherwise applicable with respect to moveable equipment, supply and installation), operations and maintenance of temporary and permanent dewatering systems to prevent groundwater from infiltrating to the Lowered Section and all other areas of the Site during both the Construction Period and the Operating Period.

v. Wells and springs may exist within the Construction Work. The Developer shall protect and maintain the flow quantity, water quality, access, and availability of the wells and springs.

f. Groundwater Treatment Facilities

As part of or in addition to the dewatering system required pursuant to Section 8.4.4.e.iv of this Schedule 10, Developer shall be responsible for the design, construction (or, as otherwise applicable with respect to moveable equipment, supply and installation), operations and maintenance of a groundwater treatment facility during both the Construction Period and the Operating Period. Without limiting its obligations under Section 23.1.2 and 23.4.2 of Schedule 17 Environmental Requirements, such groundwater treatment facility shall, at a minimum, be capable of treating any substance identified in the column headed “Chemical Name” in Appendix C of Schedule 17 Environmental Requirements (which include substances documented in the Reference Documents as existing in the groundwater prior to the Setting Date) at concentration levels equal to or less than that indicated in the “Value” column in such Appendix. Developer’s design and construction (or, as applicable, supply and installation) of such facility shall take into account, at a minimum:

i. Developer's obligations under Section 23.1 of Schedule 17 Environmental Requirements;

ii. Developer's obligations under Sections 8.1, 9.1 and 10 of the Project Agreement; and

iii. the effect, if any, of the following on the obligations referred to in i. and ii. above as they relate to groundwater contamination of:

A. Developer's use of the Reference Design or any differences between the Developer's design and the Reference Design;

B. any differences between the design, construction, supply, installation, operations and/or maintenance means and methods Developer selects for any portion of the Project and those set out, referred to or contemplated in any Department Provided Approval;

C. the incorporation of any ATC (as defined in the ITP) into this Agreement; and

D. the acquisition of any Additional ROW Parcel, Developer-risk Permit Area or Temporary Property Rights.

g. Ponds

i. The Developer shall design, construct and locate all ponds to the Ultimate design;

ii. The Developer shall coordinate with the applicable owner the design and construction of access roads to ponds. The design of access roads shall be Accepted by the Department;

iii. All ponds shall adhere to the extended detention basins (EDB) design guidance as defined in the UDFCD *Urban Storm Drainage Criteria Manual*;

iv. The Developer shall adhere to the requirements of Section 37-92-602(8) of the Colorado Revised Statutes for ponds and infiltration facilities. The Developer shall submit to the Department all information required for the statewide notification compliance portal for Acceptance; and

v. Detention of any kind is not allowed in the southeast and southwest quadrants of Steele Street and I-70 Mainline.

Table 8-5 Pond Locations

Pond Name	I-70 Mainline Station	Facility Type
Brighton West	2000+00	Flood Control Pond
Brighton East	2012+00	Flood Control Pond
York East	2028+00	Flood Control Pond
Steele North	2055+00	Flood Control Pond
Colorado North	2080+00	Flood Control Pond
Colorado South	2080+00	Flood Control Pond
Quebec North	2185+00	Water Quality Pond
Havana North #1	2292+00	Water Quality Pond
Havana North #2	2292+00	Detention Pond
Havana South	2292+00	Water Quality and Detention Pond

Onsite North[1]	Race Court and Brighton Boulevard	Water Quality and Detention Pond

vi. All ponds shall include the following:

A. A six foot minimum width concrete trickle channel with mountable curb to convey nuisance flows from inflow locations to the primary low-level outlet and shall be designed for maintenance equipment loads;

B. In locations Approved by the Department, a soft-bottom trickle channel that is a minimum of 1.5 feet deep with a minimum longitudinal slope of one percent, and that does not meander or contain riprap, can be used in place of a concrete trickle channel;

C. Pre-sedimentation forebay lined with either concrete or grouted boulders;

D. Sloping outlet structure that includes a micropool, trash rack, orifice plate and controlled release for the minor and/or major storms;

E. Grades within the basin shall not be less than 0.5 percent unless otherwise (I) Approved (where Section 8.4.4.g.vi.B of this Schedule 10 applies) or (II) otherwise Accepted by the Department;

F. Outfalls flowing into a pond shall be placed no less than 6 inches above the bottom of the forebay; and

G. Emergency spillway;

vii. The Developer shall account for an Offsite base flow in the design and construction of ponds tributary to the GLO outfall located in Brighton Boulevard. The flowrate of the base flow shall be coordinated with the Department and CCD;

viii. The Developer shall design and construct flood control ponds to capture and convey the major storm event. Water Quality Capture Volume (WQCV) shall be provided to the extent possible. The Developer shall coordinate with the Department and CCD regarding the WQCV provided and submit the WQCV as a part of the Interim Drainage Reports for Acceptance;

ix. The Developer shall design and construct water quality and detention ponds to provide for the full WQCV plus the 10 year detention volume for the minor storm, and one-half of the WQCV plus the 100 year detention volume for the major storm event;

x. The Developer shall design and construct water quality ponds to provide for the full WQCV. Alternate PSQFs for water quality ponds, as shown in CDOT *Erosion Control and Stormwater Quality Guide*, may be used with Acceptance from the Department;

xi. The Developer shall design and construct detention ponds to provide for the 10 year detention volume for the minor storm, plus the 100 year detention volume for the major storm event.

xii. The Developer shall provide the following:

A. 12 foot minimum width access road sloped at 10:1 or flatter to the bottom of the pond for maintenance equipment access to the inlet and outlet structure;

B. 12 foot minimum width access road around the top of the pond, or turn around area suitable for maintenance equipment;

[1] Subject to Section 1(i) of Part B of Schedule 28 (*Proposal Extracts*),

C. Mountable curb in locations where an access road connects to a street with curb and gutter;

D. A staging area suitable for maintenance Activities; and

E. Fall protection, where required;

xiii. The elevation of the emergency spillway or overflow structure shall be at or above the elevation of the routed 100 year water surface or at or above the elevation of the WQCV for water quality ponds. The emergency spillway or overflow structure shall have the capacity to convey the routed 100 year peak discharge. Embankments shall provide a minimum of one foot of freeboard above the routed 100 year water surface elevation through the emergency spillway;

xiv. All ponds shall be installed outside the 100 year floodplain boundary;

xv. The low-level outlet of the outlet structure shall include a debris rack with a total opening area at least twice the area of the low-level outlet;

xvi. Detention basin slopes and bottom shall be protected against erosion from inflows and circulation within the basin;

xvii. Slopes of earth embankments for detention facilities steeper than 4:1 will not be allowed unless Approved by the Department. Slopes in ponds shall be planted with a seed mix and protected by a soil retention covering per CDOT Standard Specifications;

xviii. Groundwater elevation plans shall be created by the Developer at all pond locations and submitted to the Department for Information. The plans shall show the pond, location of borehole, existing and proposed contours, groundwater elevation, and depth to groundwater. If groundwater is encountered, measures shall be taken (e.g., perimeter underdrain system or impermeable liner) to prevent groundwater seepage into the pond. Groundwater shall not pass through the forebay, trickle channel or micropool; and

xix. All pond design calculations, geometry, and details shall be provided to the Department as part of the Drainage Report.

h. Bridges and Deck Drainage

The Developer shall provide deck drainage systems for bridges when the maximum allowable flow spread for the design storm is exceeded. Inlets shall limit flow across the expansion device to less than one cubic feet per second (cfs) for the 10 year storm. Bridge deck drainage systems shall be designed in accordance with the FHWA HEC-21 *Design of Bridge Deck Drainage*. See Schedule 10, Section 13 Structures for more information regarding bridge deck drainage requirements.

8.4.5. Stormwater Pump Stations

a. The use of pump stations shall be permitted where stormwater removal by gravity is not economically feasible, as Approved by the Department; and

b. The Developer shall comply with the following requirements in relation to the design of permitted pump stations:

i. The pump stations shall be designed for the 100 year, two hour event and shall be designed with an inflow hydrograph hydraulically routed through the pump station to ensure adequacy of the pump station and connecting Storm Drain;

ii. The design shall comply with the HEC-24, Highway Stormwater Pump Station Design;

iii. The extent of the 100 year storm shall be determined and safeguards against flooding shall be provided to verify no adverse impacts to the surrounding area;

iv. A wet well shall be incorporated with the pump station design. The maximum water level in the wet well shall be more than one foot below the lowest pavement elevation to prevent surface ponding upstream of the pump station. The pump stations shall be designed with an inflow hydrograph hydraulically routed through the pump station to verify the minimum required cycle time for each pump;

v. The configuration shall provide for screening out debris and a minimum of three pumps, all of which are equal in size and type for operating flexibility. The Developer shall provide one extra pump of equal size and type for future pump maintenance and replacement. The extra pump shall be properly stored and protected from damage in a separate area inside the pump station;

vi. Pump equipment and controls shall be explosion proof, corrosion resistant and appropriate for the application;

vii. A backup system for power shall be provided to maintain a fully operational facility with capacity to run all pumps for the design flow;

viii. The design shall include access for ordinary maintenance, provisions for replacing pumps, and a minimum of two parking spaces;

ix. The pump house shall have locked doors, fence and gate for security, and an adequate ventilation system;

x. The design shall minimize the need for confined space entry as defined by Occupational Safety and Health Administration (OSHA) and National Institute for Occupational Safety and Health (NIOSH);

xi. The site layout shall adhere to the aesthetic requirements, as provided in Schedule 10, Section 14 Landscaping and Aesthetics;

xii. Noise levels from the pump station under normal operations shall be in compliance with the Local Agency noise ordinances;

xiii. The installed equipment shall be certified by the manufacturer and fully tested and commissioned prior to being placed in service;

xiv. The design shall include operation and maintenance manuals for the facility; and

xv. Utility service for the pump stations or backup system shall be as required by Schedule 10, Section 4 Utilities.

8.4.6. Irrigation Facilities

The Developer shall coordinate all modifications, crossings and connections to irrigation ditches and shall adhere to ditch company standards and requirements.

8.4.7. Floodplains

a. The Developer shall coordinate all impacts to Federal Emergency Management Agency (FEMA) regulated floodplains and changes to bridges and Cross Drains located in FEMA regulated floodplains with the Department, FEMA, UDFCD, and the Local Agency floodplain administrator;

b. The Developer shall comply with local floodplain development Permits as well as applicable National Flood Insurance Program requirements;

c. As required by the FEMA or Local Agency floodplain administrators, the Developer shall develop hydraulic models of the waterways and crossing structures to demonstrate hydraulic performance of new structures and existing structures;

d. The Developer shall apply for, obtain, and submit Conditional Letters of Map Revision (CLOMR) and Letters of Map Revision (LOMR) to the Department, for Acceptance and appropriate owner signatures, if required;

e. The Developer shall be responsible for all FEMA and other agency fees;

f. The Developer shall obtain floodplain development Permits as required by the Local Agencies; and

g. The Developer shall be responsible for and comply with submittal schedules as required by all reviewing agencies.

8.4.8. Storm Water Management Plan Updates

a. The SWMP shall be updated and submitted to the Department to document changes to design and construction Activities;

b. To verify compliance with 208.04(e) of the Project Special Provisions revision of Section 208 in Schedule 17 (hereafter referred to as "Section 208") the Developer shall submit plan drawings and electronic files of the SWMP Site Map which show the current areas of erodible earth material exposed at one time by clearing and grubbing, and earthwork operations once per month. The format of the electronic files must allow for the area to be calculated and verified (for example MicroStation or Adobe Pro with appropriate polygon shapes);

c. The Developer shall submit updates to the SWMP Site Map monthly, revising to incorporate the progress of the Construction Work; and

d. The surface area of erodible earth material exposed at one time by clearing and grubbing and earthwork operations shall not exceed 34 acres as required by Section 208.04(e). The Developer may request permission in writing to exceed the 34 acre maximum. This request must include information on the Developers plan and the resources that will be utilized to ensure compliance with the requirements of the CDPS-SPC and Section 208. Permission to exceed the 34 acre maximum will be given at the Department's discretion and may be withdrawn at any time if the Developer fails to meet the requirements of Section 208.

8.4.9. Area Specific Drainage Requirements and/or Information

a. Offsite Outfall System

The Developer shall design, construct and install the necessary drainage infrastructure required to protect the Lowered Section from the 100 year event. No Offsite flow shall be allowed to drain into the Lowered Section.

The Developer shall assume the Platte to Park Hill Stormwater Systems (P2P) projects are existing features completed by CCD in the design and construction of the Offsite Outfall. The projects included in P2P are as follows: Globeville Landing Outfall and Park, 39th Avenue Greenway and Open Channel, City Park Golf Course Redesign and Park Hill Detention.

CCD will design and construct the concrete box culvert, or equivalent, of the Globeville Landing Outfall (GLO) system within Brighton Boulevard, under the Pepsi Lead tracks to the Brighton West Pond. The Developer shall design a connection from the Brighton West Pond to the concrete box culvert, or equivalent. The maximum flow to the GLO system in Brighton Boulevard shall not exceed 463 cfs.

The timing of the combined hydrographs between the Offsite Outfall System and the 39th Avenue Greenway and Open Channel project shall be utilized by the Developer in the hydraulic analysis. A model has been provided by CCD that combines the flow from each project. For reference only, this model is provided in the Reference Documents. The Developer's hydraulic analysis of the Offsite Outfall System shall be coordinated with CCD and the Department and shall confirm no adverse impacts to the GLO system.

b. Onsite Outfall System

i. The Developer shall design, construct and install the necessary drainage infrastructure required to drain the Lowered Section. The only tributary area allowed to drain to the low point will be the roadway and associated ramps located within the Lowered Section.

ii. Subject to Section 1(i) of Part B of Schedule 28 (*Proposal Extracts*), underground detention shall be utilized to maintain the site layout needed for G&K Services if the design of the outfall system is consistent with the Reference Design.

c. 46th Avenue Drainage Design - Brighton Boulevard to Colorado Boulevard

The Developer shall design, construct and install the necessary drainage infrastructure required to meet CCD criteria and prevent Offsite flow from draining into the Lowered Section.

d. I-70 Mainline Restriping - I-25 to Brighton Boulevard

The segment of I-70 Mainline between I-25 and Brighton Boulevard will consist of restriping that substantially reduces the shoulder of the I-70 Mainline. The inlets required to meet spread criteria shall be incorporated by the Developer into the drainage design.

e. Colorado South Pond and Safeway

Subject to Schedule 18 Section 1.3.2.d, the Developer shall design, construct, install, and coordinate with Safeway and CCD to replace the existing detention and containment ponds that will be removed with the widening of the I-70 Mainline to the southeast of Colorado Boulevard. The area needed for the replacement of the containment and water quality ponds shall be located such that ownership can be transferred to Safeway for operation and maintenance of these facilities. The Developer shall comply with water quality requirements under the CCD municipal CDPS Stormwater permit.

f. Storm Drain over the Lowered Section near York Street

The Developer shall continue to utilize the historic flow capacity in the existing storm drain in York Street, north of the I-70 Mainline, subject to Section 1(b) of Part B of Schedule 28 (*Proposal Extracts*), with a structure over the Lowered Section.

g. Sand Creek

The Developer shall design and reconstruct the overflow channel for Sand Creek adjacent to the south side of the I-270 flyover, if proposed improvements negatively impact the existing overflow channel. The Developer shall coordinate with CCD, UDFCD and Local Agency floodplain administrator.

h. Quebec and Peoria Interchanges

The Developer shall provide permanent slope stabilization at each of the Quebec Street and Peoria Street interchanges to mitigate ongoing erosion issues due to sandy soils. The Developer shall provide curb with rundowns to the toe of slope at the end of proposed guardrail locations and reseed eroded areas.

i. I-225 interchange

The Developer shall provide permanent slope stabilization at the I-225 interchange to mitigate ongoing erosion issues due to sandy soils. The Developer shall extend the existing downspouts from the flyover ramps to within one foot above the existing ground surface, provide erosion protection at the outlet and reseed eroded areas.

j. Groundwater

In performing its obligations under Sections 8.4.4.e.iv and 8.4.4.f of this Schedule, Developer shall provide the necessary analysis and design for temporary dewatering

during construction and permanent treatment of groundwater for the Site. Additional information regarding groundwater conditions and requirements, including treatment, is included in Section 8.4.4.f of this Schedule and in Schedule 17 Environmental Requirements.

k. Cover

The Developer shall design, construct and install the necessary drainage infrastructure required to drain the Cover and protect the Lowered Section from the 100 year event.

Within the Cover (Planning Area 2), the minimum allowable pipe size shall be 8 inches. CCD approval is required for all inlets, grates and material type for all elements of the drainage system.

Within the Cover (Planning Area 1), the Developer shall design, construct and install drainage features necessary for the Swansea Elementary School Outdoor Areas.

Additional information and requirements regarding the Cover are included in Schedule 10, Section 12 Cover MEP System.

l. Micro Tunneling and Pipe Jacking

Micro tunneling or pipe jacking shall be permitted in areas where open cut installation of Storm Drains and Cross Drains is prohibitive. The use of rectangular pipe is prohibited unless Approved by the Department. The Developer shall:

i. Consider the use of steel, concrete, or centrifugally cast fiberglass-reinforced polymer mortar pipe. Pipe material shall be submitted by the Developer to the Department for Approval;

ii. Submit to the Department, for Acceptance, the materials, means, and methods of installation, including but not limited to the following:

A. Plan and profile with all Utilities shown and labeled with appropriate Utility ID number. All clearances between Storm Drains or Cross Drains and Utilities shall be clearly labeled;

B. Jack and boring pit locations;

C. Excavation Material Management Plan;

D. Traffic Control Plan;

E. Dewatering Plan; and

F. Quality Control Plan.

8.5. Construction Requirements

8.5.1. The Developer shall be aware that the Project is within two large existing flood-prone basins; the Montclair Basin and Park Hill Basin. The Developer shall be responsible for protecting and preserving public and private property from damage resulting directly or indirectly from stormwater runoff along or adjacent to the Site during construction of all improvements, including upstream and downstream properties.

8.5.2. The Developer is advised to coordinate with Local Agencies, including but not limited to the UDFCD, for flows that affect drainage within the Site. The Developer shall evaluate construction methods and staging during the design phase and include provisions to maintain positive drainage at all times during construction.

8.5.3. The Developer shall:

a. Store materials in areas where damage from flood waters is not likely to occur;

b. Not place fill or decrease conveyance capacity of stormwater flow paths without first installing conveyance, either temporary or permanent, to adequately perpetuate the flows in a historical manner and condition consistent with historical flows;

c. Maintain such conveyance for all existing flow areas and temporary and permanent conveyance facilities constructed as part of the Project;

d. Include necessary upstream collection facilities and extend the conveyance system downstream to a reasonable outfall location; and

e. Not divert flows from historical patterns until downstream facilities, either temporary or permanent, are in place to safely convey flows to an acceptable outfall location.

8.5.4. The Developer shall sequence construction of drainage features, including but not limited to inlets, lateral connections, storm drains, channels, and reinforced concrete boxes, so they can be connected to their appropriate outfall to convey flows as designed. If construction of the outfall cannot be completed before direct connection of upstream drainage features, the Developer shall provide temporary flow conveyance.

8.5.5. The Developer shall clean all existing drains prior to the start of Construction Work in accordance with Section 202 of the CDOT Standard Specifications.

8.5.6. The Developer shall conform to Section 206, Structure Backfill (Class 2) of the CDOT Standard Specifications for any backfill within 4 feet from the outside of a manhole.

8.5.7. The Developer shall construct temporary drainage in accordance with the Accepted Temporary Drainage Plans for each phase or stage of construction, as described in Schedule 10, Section 2 Maintenance of Traffic. Temporary drainage proposed to be abandoned shall be plugged and flow filled per CDOT Standard Specifications and submitted to the Department for Approval prior to abandonment.

8.5.8. The Developer shall survey PSQFs according to Section 6.1.3 of the CDOT *Survey Manual* to confirm the design volume has been provided during construction and documented in the As-Built plans. The Developer shall also submit a Pond Certification Letter stamped by a professional engineer that summarizes all pertinent information. This form shall be submitted prior to final seeding of the facility. The Developer shall map for inclusion into CDOT's Geographic Information System, all new and existing (remaining) outfalls.

8.5.9. Pipe Material Selection Guide

a. The Developer shall comply with the CDOT *Pipe Material Selection Guide*; and

b. Clarifications of the CDOT *Pipe Material Selection Guide* are as follows:

i. Trial installations are not allowed on the Construction Work;

ii. The Developer shall sample soil and water;

iii. References to "Project Manager" in the Guide shall be the Developer;

iv. The Developer shall provide a sampling schedule for pipe selection to the Department, for Information, 30 Calendar Days after issuance of NTP 1;

v. Pipe material selection shall be submitted as part of the Drainage Reports;

vi. Aluminum alloy pipe shall not be used; and

vii. Storm Drains that are both parallel to and within the strap zone of retaining walls shall be solid wall plastic conduit.

8.6. Drainage Reports

8.6.1. Master Drainage Report

The Developer shall prepare a Master Drainage Report and submit to the Department, for Acceptance, concurrent with the Preliminary (30% Level) Plan Package. The Master Drainage

Report shall show how the Developer's design meets the Reference Design and Ultimate configuration, as discussed in this Section.

8.6.2. Interim Drainage Reports

The purpose of an Interim Drainage Report is to actively capture and document all changes to design between the Master and Final report submittals. Interim Drainage Reports shall be submitted by the Developer to the Department for Acceptance. The Developer shall create and include an index of changes to design with each Interim Drainage Report submittal.

8.6.3. Final Drainage Reports

The purpose of the Final Drainage Report is to integrate all Accepted Interim Drainage Reports into one stand-alone report for the Project. The Final Drainage Report shall be prepared by the Developer and submitted to the Department for Acceptance prior to Substantial Completion. The Developer shall include a summary index that incorporates all interim report changes with the Final Drainage Report submittal. No addenda to the Final Drainage Report shall be permitted;

8.6.4. Drainage Reports shall follow the documentation procedure in Chapter 4 of the CDOT *Drainage Design Manual* and shall include the following:

a. Basic design data, design assumptions, hydrologic and hydraulic methodologies, assumptions, model inputs and outputs, detailed calculations, computations, and computer printouts, relevant design criteria, circumstances influencing design, discussion of all drainage issues and drainage facilities, appropriate maps, figures, and plans;

b. Rationale for sizing and selection of all drainage elements, including catch basins, Storm Drain systems, Cross Drains, ditches, swales, PSQFs, detention facilities, and pipe materials selection;

c. Hydraulic data sheets with a summary of hydraulic design information for each Storm Drain and Cross Drain;

d. A delineation of contributing basins, existing drainage patterns for both highway and cross-drainage flows, drainage parameters, inflow hydrographs for detention basins, detention basin sizing, discharge characteristics, discharge hydrographs for detention basins, detention times, and other information necessary for the design of the drainage system. All drainage reports shall include documentation of tributary flows from areas outside of each construction segment, as defined by the Developer;

e. Documentation that the proposed runoff will be controlled and treated in accordance with this Section and all drainage and water quality Permits;

f. Documentation of existing drainage discharge rates, outfall locations and pond release rates;

g. Documentation of the impact of proposed drainage designs on existing drainage facilities;

h. Documentation of compatibility with the Ultimate design; and

i. Calculations, analysis, and all related information used in developing conclusions and recommendations for PSQFs in accordance with CDOT NDRD requirements.

8.6.5. In addition to the documentation procedure in Chapter 4 of the CDOT *Drainage Design Manual*, the Developer shall follow the report outline below. The section and subsection headings shall be maintained at a minimum. If a section or subsection is not used, the reason it is not applicable to the Project shall be specified. New sections or additional subsections shall be added as necessary to fully document the drainage design:

a. Drainage Report Outline;

i. Introduction

A. Location of improvements;

B. Description of improvements; and

C. Discussion of drainage investigation.

ii. Cross Drainage, Drainageway, and Irrigation Ditch Crossings

A. Location and general discussion;

B. Hydrology and design flow development;

C. Information sources;

D. Pipe material selection;

E. Agency coordination (i.e. UDFCD, Local Agencies);

F. Description of structural design (i.e. for non-CDOT standard CBCs);

G. Hydraulic design;

H. Groundwater and sub-drainage features;

I. Drainageways and floodplains;

J. Scour analysis; and

K. Bank stabilization.

iii. Roadway Drainage Systems

A. General discussion

B. Design coordination

(I) Adjacent segments; and

(II) Agency coordination.

C. Drainage Basin Delineations & Characterization

(I) Existing basins; and

(II) Proposed basins.

D. Hydrology and Design Flow Development

E. Pavement, Median and Roadside Drainage

(I) Inlet/Catch basin spacing design;

(II) Storm Drain design;

(III) Roadside ditch and channel design; and

(IV) Erosion control design.

iv. Cover (Planning Area 2) and Cover (Planning Area 1) Drainage Systems

A. General discussion

B. Design coordination

(I) Adjacent segments; and

(II) Agency coordination.

C. Drainage Basin Delineations & Characterization

(I) Proposed basins.

D. Hydrology and Design Flow Development

E. Pavement, Median and Roadside Drainage

(I) Inlet/Catch basin spacing design, and;

(II) Storm Drain design.

v. Permanent Stormwater Quality Facilities

A. Assumptions and methodologies

(I) Allowable release rate discussion

B. Hydrology and Hydraulics

(I) Storage and outlet design documentation

C. Adherence to the CDOT MS4 Permit and NDRD requirements.

D. Adherence to Local Agency Permit requirements

vi. Appendices

A. Hydrologic Analysis

(I) Onsite hydrology;

(II) Offsite hydrology;

(III) Precipitation data;

(IV) Soil survey;

(V) Land use; and

(VI) FEMA maps.

B. Hydraulic Analysis

(I) Spread width, Inlet and Storm Drain calculations;

(II) Roadside ditch and channel calculations;

(III) Hydraulic grade line calculations;

(IV) Drain outfalls, scour and erosion control calculations; and

(V) Groundwater and sub-drainage systems.

C. Permanent Stormwater Quality Facilities

(I) Extended detention basin calculations;

(II) Stage storage calculations;

(III) Trickle channel calculations; and

(IV) Water quality structure calculations.

D. Basin Maps

(I) Existing and proposed Onsite basin maps; and

(II) Offsite Basin maps (full size 22 inch x 34 inch sheets).

vii. References.

b. The Developer shall submit to the Department one hard copy of the Master Drainage Report, one hard copy of all Interim Drainage Reports, and three hard copies of the Final Drainage Report for Acceptance. All Drainage Reports shall be signed and sealed;

c. The Developer shall submit, to the Department, an electronic copy of all signed and sealed drainage reports in PDF format; and

d. The Final Drainage Report shall include electronic copies of all computer analysis input and output files in the native file format.

8.7. Water Quality Reports

8.7.1. The Developer shall prepare Water Quality Reports to document permanent water quality design decisions for compliance with the CDPHE. All decisions shall adhere to the NDRD program as part of CDOT's overall MS4 Permit.

8.7.2. The Developer shall prepare a Master Water Quality Report and submit to the Department, for Acceptance, concurrent with the Preliminary (30% Level) Plan Package. The Master Water Quality Report shall show how the Developer's design meets the Reference Design and Ultimate configuration, as discussed in this Section 8.

8.7.3. The purpose of an Interim Water Quality Report is to actively capture and document all changes that affect permanent water quality between the Master and Final report submittals. Interim Water Quality Reports shall be submitted by the Developer to the Department for Acceptance. The Developer shall create and include an index of changes to design with these reports to reflect the content of the Final Water Quality Report.

8.7.4. The purpose of the Final Water Quality Report is to integrate all Accepted Interim Water Quality Reports into one stand-alone report for the Project. The Final Water Quality Report, shall be prepared by the Developer and submitted to the Department for Acceptance prior to Substantial Completion. The Developer shall include a summary index that incorporates all interim report changes with the Final Water Quality Report submittal. No addenda to the Final Water Quality Report shall be permitted.

8.7.5. The Water Quality Reports shall reference the applicable drainage report for all technical aspects and design calculations.

8.7.6. The Water Quality Reports shall include the following:

a. All assumptions, circumstances influencing design, applicable design standards and/or requirements, and design criteria-related decisions;

b. Design decisions shall be documented and shall be based on sound engineering principles;

c. All related references including maps, figures, and plans shall be provided in an appendix to the reports;

d. Documentation of tributary flows from areas outside of each defined construction segment; and

e. An exhibit showing the Construction Work in relation to the MS4 boundary area.

8.7.7. The Developer shall prepare an NDRD exhibit to be included with all Water Quality Reports. The NDRD exhibit shall include the following:

a. A delineation of each basin with a colored, solid-filled, hatch pattern. Each basin shall be tributary to a specific PSQF. Provide different colors for each PSQF basin. These basins shall incorporate the sub-basins found in the Drainage Reports;

b. A label for each water quality basin. Include the typical basin designation circle label. Include within the circle the water quality basin ID, the basin area, and the impervious area with that basin. Provide a legend to describe the basin designation label;

c. A label for the proposed PSQFs serving each basin. The Developer shall ensure that the location of the PSQF matches the proposed locations found in the construction drawings;

d. Flow direction arrows;

e. A delineation of disturbed areas for the Construction Work; and

f. A table with six column headings. The column headings shall be; Basin, Color, Basin ID, Type of PSQF used to Treat Area, Required Impervious Area to be Treated, Increased Impervious Area Treated, and Comments. At the bottom of the table sum the columns for increased impervious area to be treated and the actual impervious area treated.

8.7.8. The Developer shall submit to the Department one hard copy of the Master Water Quality Report, one hard copy of all Interim Water Quality Reports and three hard copies of the Final Water Quality Report for Acceptance. All Water Quality Reports shall be signed and sealed.

8.7.9. The Developer shall submit one electronic copy of all signed and sealed Water Quality Reports in PDF format.

8.7.10. The Water Quality Reports shall follow the report outline below. New sections or additional subsections shall be added as necessary to fully document the design:

a. Water Quality Report Outline

i. Table of Contents

ii. Introduction

A. Vicinity Map;

B. Site location, stationing;

C. State highway number;

D. Name of receiving waters;

E. Location of existing and proposed outfalls;

F. Geographic reference (county, nearest town); and

G. Jurisdictional MS4 boundary areas.

iii. Discussion of CDOT MS4/NDRD Requirements

A. Discussion of how proposed PSQFs satisfy CDOT's MS4 requirements;

B. Site map showing locations of PSQFs;

C. Relationship of PSQFs to major drainageway and outfall systems plans;

D. Detailed description, design criteria, and references to specifications and technical details of PSQFs as documented in the applicable Drainage Reports;

E. Detailed descriptions, design criteria, and locations of stream stabilization measures to be implemented;

F. Design objectives;

G. Treatment options;

H. Expected pollutant removal rates;

I. Existing water quality features that will be abandoned, reconfigured, or incorporated into a new design;

J. ROW needs and/or concerns;

K. Recommended design; and

L. Maintenance and operation requirements, inspection protocols, and maintenance schedule.

iv. The following topics shall be addressed in detail:

A. Description of project and land disturbance in acres;

B. What area (in acres) is required to be treated, what area (in acres) of treatment is provided, what area (in acres) is not treated, and what area (in acres) is treated in addition to what is required. The discussion shall distinguish between CDOT MS4 area and non-CDOT MS4 area. Include this information in the report and as a note on the NDRD exhibit;

C. Detailed description, design criteria, justifications, decision making process (why a permanent BMP was chosen over another), location of permanent BMPs to be implemented, and analysis as to how permanent BMPs (combination or individual) satisfy the current CDOT NDRD requirements; and

D. Provide the certification number for the CDPS Construction Permit for the Construction Work.

v. Maintenance and Operation

A. Narrative description of the facility

Example: Extended detention pond with a single cell outlet structure with an orifice plate which is designed for a 40 hour drain time. Three inlets drain into the basin which has a concrete lined forebay with grouted riprap berm. The forebay is designed to drain within five minutes and keep out large floatable/debris.

B. Narrative description of maintenance access to the facility

Example: maintenance access off of southbound I-25 before guardrail or take ramp from southbound I-25 to westbound Speer. Parking is from the shoulder.

C. Narrative description of what maintenance work will need to be done and at what frequency to ensure continued effectiveness of the facility.

Example:

(I) Mowing basin to keep vegetation controlled so water can continue to flow unhindered. Remove vegetation from facility to keep from re-clogging grates and orifice plate;

(II) Clean trash rack/grates of debris and dispose of off of PSQF site;

(III) Clear orifice plate holes so water can continue to flow;

(IV) Remove sediment from basin when reaches lowest orifice hole or blocking forebay outlet pipe. Can use hand shovels, bobcats/skid steers;

(V) Remove sediment off of PSQF site to keep from re-polluting the pond;

(VI) Re-seed as necessary to keep area stable of erosion;

(VII) Add additional erosion control items to keep area stable; and

(VIII) Tighten/replace trash rack bolts and screens as necessary to keep structure in working order.

D. Documentation of commitments from responsible agency (such as Intergovernmental Agreements, Memoranda of Understanding, etc.) or

owner to maintain the PSQF's shall be required and included with the Final Water Quality Report.

vi. Appendix

A. Construction Work in relation to MS4 boundary area exhibit; and

B. NDRD Exhibit.

8.8. Drainage Plans

8.8.1. The Developer shall prepare plans for all drainage related facilities for the Construction Work in a format that follows the documentation procedure in Chapter 4 of the CDOT *Drainage Design Manual,* CDOT *CADD Manual* and CDOT *Drafting Manual.*

8.8.2. The Developer shall submit all applicable plans with each drainage report.

8.8.3. Plans shall be submitted with changes to design. The Developer shall include the following for all drainage plan deliverables:

a. Plan View

i. Provide the location of all existing and proposed drains and Approved abandoned pipe locations. Provide a label for each proposed drain and Approved abandoned pipe locations. The Developer shall establish a labeling system that is specific to each proposed storm drain system and provide a table to summarize all pertinent information. The table shall include the drain line and sheet number where the profile can be found;

ii. Provide the location of all existing and proposed inlets, manholes, end sections, and outlet protection. Provide a label for each proposed inlet, manhole, end section, and outlet protection. Include a table that summarizes all pertinent information. The table shall include the label ID, station and offset, item, length, pay depth, and notes;

iii. Provide all existing and proposed grading;

iv. All Utilities and As-Built information for relocated Utilities shall be accurately shown;

v. Provide location of existing and proposed ROW lines;

vi. Label locations of all drains to be removed, abandoned with flowfill or Approved for reuse. Include description and length of drain; and

vii. Provide locations of all proposed permanent underdrains. Include locations of existing underdrains to be utilized with the Project as discovered during Construction Work. Provide a label for each underdrain location, clean out, fittings, and outlet. The Developer shall establish a labeling system that is specific to each underdrain system and provide a table to summarize all pertinent information. The table shall include the drain line and sheet number where the profile can be found and include the label ID, station and offset, item, length, and notes.

b. Profiles

i. Provide profiles for all proposed Storm Drains or existing Storm Drains Approved for reuse. Include the label ID from plan view sheets, station and offset, invert elevations, rim elevations, structure depth, slopes, sizes, material, existing and proposed finished grade lines, the design flow for the 10 year and 100 year event, and the calculated HGL for the 10 year and 100 year event. All Utilities shall be accurately shown and labeled with appropriate Utility ID number. All clearances between Storm Drains and Utilities shall be clearly labeled;

ii. Provide profiles for all proposed Cross Drains or existing Cross Drains Approved for reuse. Include the label ID from plan view sheets, station and offset, invert elevations, slopes, sizes, material, existing and proposed finished grade lines, the drainage area of contributing basin, the design flow for the 10 year and 100 year event, the calculated hydraulic grade line (HGL) for the 10 year and 100 year event, and headwater elevation. All Utilities shall be accurately shown and labeled with appropriate Utility ID number. All clearances between Cross Drains and Utilities shall be clearly labeled;

iii. Provide profiles for all underdrains. Include the label ID from plan view sheets, station and offset, invert elevations, slopes, sizes, material, and existing and proposed finished grade lines. All Utilities shall be accurately shown and labeled with appropriate Utility ID number. Underdrain profiles may be combined with Storm Drain and Cross Drain profiles where applicable; and

iv. Provide location of design groundwater elevation in all profiles located within the Brighton Boulevard to Colorado Boulevard Construction Work.

c. Include details for all non-standard CDOT items.

d. Details for EDB

i. Provide each EDB in plan view. Provide existing and proposed contours that define limits of overall facility. Include access roads, overflow location or structure, forebay, trickle channel, micropool, and outlet structure. Include locations of all property lines. Include point labels to define location and elevations within the facility;

ii. Provide a table summarizing each point label. The table shall include the point label, station and offset, northing, easting, elevation and notes;

iii. Provide a cross section of the EDB from where flows enter the pond to the outlet structure. Label elevations for the WQCV, 10 year, and 100 year events. Include slopes and elevations of all features;

iv. Provide a geometry plan of the EDB from where flows enter the pond to the outlet structure. Include access roads;

v. Provide specific details for the forebay, trickle channel, micropool, and outlet structure; and

vi. All Utilities shall be accurately shown and labeled with appropriate Utility ID number.

8.8.4. Temporary Drainage Plan

a. The Developer shall submit Temporary Drainage Plans concurrently with each Temporary Traffic Control Plan (TCP), when required, to the Department for Acceptance as described in Schedule 10, Section 2 Maintenance of Traffic, and with changes to design; and

b. The Developer shall provide the location of all Approved abandoned drains. The Developer shall establish a labeling system that is specific to each temporary storm drain system and provide a table to summarize all pertinent information. The table shall include temporary connection locations, the drain line and sheet number where applicable profiles can be found.

8.8.5. Pond Certification Letter

a. The Developer shall prepare and submit to the Department a Pond Certification Letter signed and stamped by a Colorado licensed professional engineer. This form shall be completed before final seeding and submitted for Acceptance prior to Acceptance of the As-Built documents; and

b. The form shall include the following information for each pond:

i. Include the statement "I (professional engineer), certify that I have reviewed all As-Built survey information provided by (Developer) for (pond name) within the Project and hereby certify that the pond was constructed in accordance with the approved design plans.";

ii. Provide a pond volume table summarizing the WQCV, 10 year volume plus WQCV and the 100 year volume plus one half the WQCV. Identify the design volume, design elevation, As-Built volume and As-Built elevation for each of the items listed;

iii. Provide a pond elevation table summarizing the design and As-Built elevation for the emergency overflow, top of pond, inlet, and outlet;

iv. Provide a pond release rate table summarizing the design and As-Built 10 year and 100 year release rates and flow over spillway. Include the length of spillway for design and As-Built conditions;

v. Attach Applicable As-Built plan, profile and detail sheets with the Pond Certification Letter; and

vi. The Pond Certification Letter shall be submitted to the Department with all changes to design.

8.9. As-Built Documents

All plans, profiles, details, Approved abandoned pipe locations, and other information required to be prepared in accordance with this Section shall be updated based on surveys of what was actually built in the field and submitted to the Department for Acceptance.

8.10. Deliverables

At a minimum, the Developer shall submit the following to the Department for Information, Acceptance, or Approval in accordance with the specified timeframes:

Table 8-6 Deliverables

Deliverable	Information, Acceptance or Approval	Schedule
Use of stormwater pump station	Approval	As required
Final Drainage Report	Acceptance	Prior to Substantial Completion
Final Water Quality Report	Acceptance	Prior to Substantial Completion
Interim Drainage Reports	Acceptance	Concurrent with Final (100% Level) Plan Package and RFC Documents
Interim Water Quality Reports	Acceptance	Concurrent with Final (100% Level) Plan Package and RFC Documents
Master Drainage Report	Acceptance	Concurrent with Preliminary (30% Level) Plan Package
Master Water Quality Report	Acceptance	Concurrent with Preliminary (30% Level) Plan Package
Pond Certification Letter	Acceptance	Prior to Final Acceptance
Temporary Drainage Plans	Acceptance	Concurrent with Temporary Traffic Control Plan (TCP)
Pipe Abandonment Locations	Approval	Prior to Abandonment
Pipe Reuse Locations	Approval	Prior to RFC Documents
CLOMR	Acceptance	Prior to RFC Documents
LOMR	Acceptance	Prior to Substantial Completion
SWMP	Acceptance	Prior to RFC Documents
SWMP Site Map Updates	Acceptance	Monthly during the Construction Period
Sampling Schedule for pipe selection	Information	30 Calendar Days after issuance of NTP 1
Micro tunneling and/or pipe jacking materials means and methods of installation	Acceptance	Prior to RFC Documents
Pipe connections to manholes with material other than concrete	Information	Prior to RFC Documents
Groundwater Elevation Plans	Information	Concurrent with Preliminary (30% Level) Plan Package
Information required for the statewide notification compliance portal	Acceptance	Prior to Final Acceptance

8.11. Appendices

Appendix A Project Special Provisions

Appendix A
Project Special Provisions

The following special provisions supplement or modify and take precedence over the Standard Specifications. The provisions of Appendix A to Schedule 10A Applicable Standards and Specifications apply to these Project Special Provisions.

PROJECT SPECIAL PROVISIONS

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REVISION OF SECTION 603
CULVERTS AND SEWERS

The following specifications modify and take precedence over the Standard Specifications. The requirements of Schedule 10 Section 6 apply to these Project Special Provisions.

Subsection 603.07(a) shall include the following:

> Joints for all circular and elliptical reinforced pipe shall be made with confined rubber gaskets. Concrete collars shall be required at all nonstandard joints (not tongue and groove or bell and spigot), and at all connections to existing pipe.

Subsection 603.07(c) shall include the following:

> All welding of pipe and fittings for plastic conduit shall be performed by qualified and certified personnel trained in Extrusion Welding. Certifications shall be provided to the Department prior to performing any welding for the Project
>
> In order to limit thermal expansion, all connections made to concrete structures shall be made a minimum of 24 hours after the pipe has been installed and backfilled.

REVISION OF SECTION 705
JOINT, WATERPROOFING, AND BEARING MATERIALS

The following specifications modify and take precedence over the Standard Specifications. The requirements of Schedule 10 Section 6 apply to these Project Special Provisions.

Delete the first paragraph of Subsection 705.03 Gaskets and replace with the following:

> Rubber gasketed joints shall conform to the requirements of ASTM C443 and shall be flexible and able to withstand expansion, contraction, and settlement.

9. ROADWAY

9.1. General

The Developer shall design and construct all roadways, and associated roadway items, including earthwork, pavements, curbs, medians, islands, barriers, guardrail, fences, incidentals and other roadside items.

9.2. Applicable Standards

All Construction Work required to be performed by the Developer pursuant to this Section 9 shall comply with the Construction Standards, the relevant requirements listed in this Section 9, Good Industry Practice, and the following:

a. Appendix A Roadway Design Criteria to this Section 9; and

b. Conform to the Roadway Typical Sections as provided in Schedule 10B Contract Drawings.

9.3. Design Requirements

9.3.1. Local Agency Roadways shall be designed and constructed according to the Local Agency's standards and requirements. Where particular Elements of design and construction are not covered by Local Agency standards, the applicable Federal and State Construction Standards shall apply. With the exception of the I-70 Mainline, I-225 and I-270, Local Agency standards shall also be applied to all CDOT Roadways between the back of curb and the ROW line. In addition to Local Agency standards, the Developer shall follow Local Agency Municipal Codes and Ordinances as applicable to the Project. Applicable Codes and Ordinances include, but may not be limited to the following:

a. Revised Denver Municipal Code Ordinance, Section 49-141: Location and width of curb cuts;

b. Revised Denver Municipal Code Ordinance Section 49-142: Alteration of existing curb cuts;

c. Denver Zoning Code 10.4.5.2A and B, Vehicular Access: Access from Public ROW;

d. Denver Zoning Code 10.4.7.5, Amount Required: Amount of off-street loading and maneuvering space; and

e. Denver Zoning Code, On-site Design: Design of drive isles, parking stalls and setbacks.

9.3.2. The Developer shall design and construct alleyway connections in accordance with the City and County of Denver (CCD) Transportation Standards and Details.

9.3.3. Intelligent Transportation Systems (ITS) ITS and Electronic Toll Collection (ETC) infrastructure shall comply with the requirements in Schedule 10, Section 3 ITS and Tolling Equipment. Within the full reconstruction limits, to the extent required pursuant to this Schedule 10, the Developer shall install ETC and ITS infrastructure with the accommodation for addition of a future Tolled Express Lane.

9.3.4. The Developer's design shall adhere to the commitments established within the I-70 East EIS. The number, type, and width of traffic lanes, interchange locations, highway and local roadway access are specified in the I-70 East EIS and constitute the Ultimate configuration. All roadway infrastructure Elements shall be designed and constructed to meet the requirements set out in this Section 9 and shall accommodate, to the extent practical, the Ultimate configuration. Considerations include horizontal and vertical geometry, vertical clearances and cover over underground structures, and superelevation.

9.3.5. The Roadway Typical Sections represent a graphical detail of the roadway section widths and components listed in Appendix A Roadway Design Criteria to this Section 9. The Roadway Typical Section information shall form the basis of the Developer's design for typical lane and shoulder widths, curb and sidewalk locations and cross slopes.

9.3.6. New traffic signals shall be provided at intersections as required in Schedule 10, Section 11, Signing, Pavement Markings, Striping, Signalization, and Lighting. Application of roadway and pedestrian sight distance triangles required for the design of CCD traffic signal placement, intersecting roadways, driveways and alleyways, shall be in accordance with the CCD Transportation Engineering Plan (TEP) Review Submittal Requirements.

9.3.7. For reference, the Reference Documents include the Interstate Access Request (IAR). It shall be the Developer's responsibility to modify and obtain required Governmental Approvals and Permits should alternate design concepts be utilized by the Developer.

9.4. Construction Work Requirements

9.4.1. I-70 Mainline

a. Pecos Street to Brighton Boulevard (eastbound): Signing, Restriping, ETC and ITS Infrastructure

i. Utilizing the existing pavement width of the I-70 pavement, the Developer shall provide a new single eastbound Tolled Express Lane beginning approximately 2,100 feet west of Washington Street and extending east to the point of full I-70 Mainline reconstruction at Brighton Boulevard. Tolled Express Lane signage and ITS installation shall begin between Pecos Street and I-25 in accordance with the requirements of Schedule 10, Section 3 ITS and Tolling Equipment.

ii. The eastbound I-70 Mainline shall meet the following minimum design requirements:

A. Provide an inside shoulder;

B. Provide a single Tolled Express Lane as required by Section 9.4.1.a.i;

C. Provide a buffer between Tolled Express Lane and adjacent General Purpose Lanes;

D. Maintain current number of existing General Purpose Lanes and auxiliary lanes; and

E. Provide an outside shoulder width meeting the design criteria specified in this Section 9.

b. I-25 to Brighton Boulevard (westbound): Signing, Restriping, ETC and ITS Infrastructure

i. Utilizing the existing pavement width of the I-70 pavement, the Developer shall provide a single westbound Tolled Express Lane from the point of full I-70 Mainline reconstruction at Brighton Boulevard and extending to approximately 1,100 feet west of Washington Street.

ii. The westbound I-70 Mainline shall meet the following minimum design requirements:

A. Provide an inside shoulder;

B. Provide a single Tolled Express Lane as required by Section 9.4.1.b.i;

C. Provide a buffer between Tolled Express Lane and adjacent General Purpose Lanes;

D. Maintain current number of existing General Purpose Lanes and auxiliary lanes; and

E. Provide an outside shoulder width meeting the design criteria specified in this Section 9.

c. Brighton Boulevard to Colorado Boulevard: Full Reconstruction of Highway Below Grade

i. The I-70 Mainline shall be reconstructed to provide three General Purpose Lanes and two Ultimate Tolled Express Lanes with associated ITS infrastructure in each direction. The Developer is required to construct one Tolled Express Lane with the accommodation for one additional future Tolled Express Lane. The Developer is responsible for delineating and striping one Tolled Express Lane, with weave zones, in each direction as part of the Construction Work.

ii. The I-70 Mainline shall be reconstructed to meet the following requirements:

A. Provide an inside shoulder (width to include a future Ultimate second Tolled Express Lane with inside shoulder);

B. Provide a single Tolled Express Lane, adjacent to the General Purpose Lanes;

C. Provide a buffer between Tolled Express Lane and adjacent General Purpose Lanes;

D. Provide three General Purpose Lanes; and

E. Provide an outside shoulder meeting the design criteria specified in this Section 9.

iii. The Developer shall provide ramp acceleration and deceleration lanes, including continuous auxiliary lanes in both directions: between the Brighton Boulevard and Colorado Boulevard interchanges in the eastbound direction, and between Brighton Boulevard and Steele Street/Vasquez Boulevard in the westbound direction.

d. Colorado Boulevard to Sand Creek Bridge: Reconstruction of Highway on alignment

i. The I-70 Mainline shall be reconstructed to provide three General Purpose Lanes and two Ultimate Tolled Express Lanes with associated ITS infrastructure in each direction, extending reconstruction of the I-70 Mainline to the west side of the existing Sand Creek bridge. The Developer is required to construct one Tolled Express Lane with accommodation for one additional future Tolled Express Lane. The Developer is responsible for delineating and striping one Tolled Express Lane, with weave zones, in each direction as part of the Construction Work.

ii. The I-70 Mainline shall be reconstructed to meet the following requirements:

A. Provide an inside shoulder (width to include a future Ultimate second Tolled Express Lane with inside shoulder);

B. Provide a single Tolled Express Lane, adjacent to the General Purpose Lanes;

C. Provide a buffer between Tolled Express Lane and adjacent General Purpose Lanes;

D. Provide three General Purpose Lanes; and

E. Provide an outside shoulder meeting the design criteria specified in this Section 9.

iii. The Developer shall provide ramp acceleration and deceleration lanes, including continuous auxiliary lanes in both directions, between the Colorado Boulevard and Holly Street interchanges, and the Holly Street and Quebec Street interchanges.

e. Sand Creek Bridge to Chambers Road: Widening and Overlay, Restriping, and ITS Infrastructure

i. The existing I-70 Mainline shall be widened to provide an equivalent number of General Purpose Lanes as currently exist, plus one new Tolled Express Lane with associated ITS infrastructure in each direction.

ii. The Developer shall widen the existing I-70 Mainline to meet the following requirements:

A. Provide an inside shoulder;

B. Provide a single Tolled Express Lane, adjacent to the General Purpose Lanes;

C. Provide a buffer between Tolled Express Lane and adjacent General Purpose Lanes;

D. Provide General Purpose Lanes, maintaining current number of existing General Purpose Lanes;

E. Provide an outside shoulder meeting the design criteria specified in this Section 9;

F. Ramp acceleration and deceleration lanes, including continuous auxiliary lanes, shall be provided as follows:

(I) Continuous auxiliary lanes in both directions, between the Quebec Street and Central Park Boulevard interchanges;

(II) Continuous auxiliary lanes in both directions, between the Central Park Boulevard and Havana Street interchanges;

(III) Continuous auxiliary lane in the westbound direction, between the Peoria Street and Havana Street interchanges;

(IV) Continuous auxiliary lane in the eastbound direction, between the Peoria Street and I-225 interchanges; and

(V) Continuous auxiliary lane in the eastbound direction, between the I-225 and Chambers Road interchanges.

G. Reconstruct the I-70 Mainline over Peoria Street, including approaches as needed to obtain the vertical clearance over Peoria Street, in accordance with the Ultimate configuration.

iii. The Developer shall provide ramp connections to existing I-70. Number and width of lanes and shoulders shall be as described in Appendix A Roadway Design Criteria to this Section 9.

iv. In areas of asphalt pavement widening, the existing pavement shall be saw cut to a neat line along the final edge of lane line, or in the middle of the final lane location. Saw cuts and pavement joints shall not be permitted within the wheel tracks of a final lane location.

9.4.2. I-70 Mainline Interchanges

a. Washington Street Interchange

i. The Washington Street westbound entrance ramp shall provide a minimum of 385 feet dual ramp meter queuing, as measured from the ramp meter stop bar to the cross street.

ii. The Washington Street eastbound entrance ramp shall provide a minimum of 485 feet dual ramp meter queuing, as measured from the ramp meter stop bar to the cross street.

b. Brighton Boulevard and Interchange Ramp Reconstruction

i. The Brighton Boulevard Interchange shall be reconstructed to provide for the lowering of the I-70 Mainline profile to cross under the Union Pacific Railroad (UPRR) 36th Yard, and extend eastward. Ramp connectivity from Brighton Boulevard to I-70 shall be provided as westbound entrance, eastbound exit, westbound exit, and eastbound entrance ramps.

ii. The Developer shall reconstruct the existing diamond interchange at Brighton Boulevard to provide a new diamond interchange in accordance with the following requirements:

A. At the Brighton Boulevard westbound entrance ramp, the Developer shall provide two receiving lanes transitioning to a single-lane ramp with single-lane entrance and acceleration lane. A minimum of 600 feet dual ramp meter queuing, as measured from the ramp meter stop bar to the cross street shall be provided. Transition taper to single lane may match that provided in the Reference Design;

B. At the Brighton Boulevard eastbound exit ramp, the Developer shall provide a three-lane connection to Brighton Boulevard that includes left turn, left/thru and thru/right lanes while maintaining the existing free-flow right turn to Brighton Boulevard;

C. At the Brighton Boulevard westbound exit ramp, the Developer shall provide a single-lane exit transitioning to a combined ramp/46th Avenue connection to Brighton Boulevard that includes dual left-turns, a thru and a thru/right lane; and

D. At the Brighton Boulevard eastbound entrance ramp, the Developer shall provide a two-lane ramp with two-lane entrance and single-lane acceleration lane. A minimum of 440 feet dual ramp meter queuing, as measured from the ramp meter stop bar to the cross street shall be provided.

iii. Reconstruction of Brighton Boulevard shall provide two thru lanes and two left-turn lanes in each direction between the I-70 ramps. Ten foot multi-use path sidewalk shall be provided along the west side and 10 foot wide sidewalk along the east side of Brighton Boulevard under the I-70 Mainline bridge; North and south of the bridge, sidewalks shall be provided for the length of new roadway construction. The Developer shall include raised medians to separate the southbound and northbound lanes of Brighton Boulevard within the interchange and accommodate bridge pier placement as necessary.

iv. Free right turns shall be constructed on both the southwest and southeast quadrants. The Developer shall include pedestrian warning signage at each location that includes rectangular rapid flashing beacons (RRFB) and advanced warning signs as shown in the Free Right Turn Pedestrian Signing Exhibit provided in the Reference Documents.

v. The Developer's Brighton Boulevard Construction Work between 44th Street and the ramps south of I-70 shall add a northbound right turn lane on Brighton Boulevard from north of 44th Street to the eastbound entrance ramp and new 46th Avenue. A thru/right and exclusive right-turn shall be provided on northbound Brighton Boulevard to the eastbound entrance ramp and 46th Avenue South. The leftmost lane of the dual right-turn shall be signal controlled. Ramp terminals on the west side shall be aligned with the 46th Avenue/ramp

terminals on the east side to provide for minimum two-lane thru traffic movements across the intersection. The horizontal alignment, for the northbound and southbound thru lanes, may match existing conditions – not exacerbating any existing roadway geometry.

vi. The Developer's Brighton Boulevard Construction Work between the ramps north of I-70 and 47th Avenue including the 47th Avenue intersection shall be reconstructed to provide two thru lanes in each direction, turn lanes, and sidewalks. Southbound Brighton Boulevard approaching the north I-70 Ramp junction shall include: one right turn lane, two thru lanes, and one lane for left turn storage to EB I-70.

vii. 47th Avenue eastbound shall include a left and thru/right lane, while 47th Avenue westbound shall include a left, thru, and right lane to Brighton Boulevard. Brighton Boulevard northbound shall include a left and thru/right lane, while Brighton Boulevard southbound shall include a thru/right lane north of 47th Avenue and two thru lanes south of 47th Avenue. 47th Avenue shall maintain a single thru lane, in both directions, between Baldwin Court and Williams Street.

c. Steele Street/Vasquez and Colorado Boulevards, Interchanges and Ramp Reconstruction

i. The existing Steele Street/Vasquez and Colorado Boulevard interchanges shall be reconstructed to allow for lowering the I-70 Mainline below the roadways. Ramp connectivity to Steele Street/Vasquez and Colorado Boulevard from the I-70 Mainline shall be designed and constructed as a split diamond interchange with supplemental ramp connections on the west side of Colorado Boulevard. Specifically, ramp connectivity shall be provided for the following movements:

A. Westbound entrance ramp from Steele Street/Vasquez Boulevard;

B. Eastbound exit ramp to Steele Street/Vasquez Boulevard;

C. Westbound entrance slip ramp from Colorado Boulevard;

D. Eastbound exit slip ramp to Colorado Boulevard;

E. Westbound exit ramp to Colorado Boulevard; and

F. Eastbound entrance ramp from Colorado Boulevard.

ii. The Developer shall construct the ramps and ramp connections described above in accordance with the following criteria:

A. The Steele Street/Vasquez Boulevard westbound entrance ramp shall provide a minimum 750 feet dual ramp meter queuing, as measured from the ramp meter stop bar to the cross street. The ramp shall transition, following the ramp meter stop bar, to a single lane entrance and acceleration lane;

B. The Steele Street/Vasquez Boulevard eastbound exit ramp shall have a single-lane ramp with single-lane exit and deceleration lane. A four-lane connection that includes dual left-turn lanes, a thru lane, and a thru/right lane shall be provided to Steele Street/Vasquez Boulevard;

C. The Steele Street/Vasquez Boulevard westbound 46th Avenue connection shall have a four-lane connection that includes dual left-turn lanes, a thru lane, and a thru/right lane provided;

D. The Steele Street/Vasquez Boulevard eastbound 46th Avenue connection shall have a two receiving-lane connection provided;

E. The Colorado Boulevard westbound entrance ramp shall provide a minimum 1,060 feet dual ramp meter queuing, as measured from the

ramp meter stop bar to the cross street. The ramp shall transition, following the ramp meter stop bar, to a single lane entrance and acceleration lane;

F. The Colorado Boulevard eastbound exit ramp shall have a single-lane ramp with single-lane exit and deceleration lane. A four-lane ramp terminal connection that includes a left-turn lane, a thru/left lane, a thru/right lane and a right turn lane shall be provided to Colorado Boulevard;

G. The Colorado Boulevard westbound exit ramp shall have a single-lane exit transitioning to a combined ramp/Stapleton Drive North connection to Colorado Boulevard. A five-lane connection that includes dual left-turn lanes, a thru/left lane, a thru/right lane, and a right-turn lane shall be provided to Colorado Boulevard; and

H. The Colorado Boulevard eastbound entrance ramp shall provide a minimum 650 feet dual ramp meter queuing, as measured from the ramp meter stop bar to the cross street. The ramp shall transition, following the ramp meter stop bar, to a single lane entrance and acceleration lane.

iii. Steele Street/Vasquez Boulevard shall be reconstructed to provide two thru lanes between 45th Avenue and 46th Avenue North, in both directions, and three thru lanes between 46th Avenue North and 48th Avenue, in both directions. The reconstruction shall also provide left and right turn movements for the new I-70 ramps and 46th Avenue. Dual-left turns shall be provided from Steele Street/Vasquez to the westbound entrance ramp, and a single left turn provided from Steele Street/Vasquez to eastbound 46th Avenue South. Construction shall include a right-in/right-out intersection at 47th Avenue.

iv. A thru/right and exclusive right-turn shall be provided at the southbound Steele Street/Vasquez to westbound 46th Avenue/I-70 ramp. The leftmost lane of the dual right-turn shall be signal controlled. 46th Avenue/ramp terminals on the west side shall be aligned with the ramp terminals on the east side to provide for minimum two-lane thru traffic movements across the intersection.

v. Free right turns shall be constructed on both the northwest and southeast quadrants of the Steele Street/Vasquez Boulevard interchange. The Developer shall include pedestrian warning signage at each location that includes rectangular rapid flashing beacons (RRFB) and advanced warning signs as shown in the Free Right Turn Pedestrian Signing Exhibit provided in the Reference Documents.

vi. Colorado Boulevard shall be reconstructed to provide three thru lanes, in both directions, and provide dual left and separate right turn movements to the I-70 ramps and new 46th Avenue. The limits of reconstruction on Colorado Boulevard shall extend from the north abutment of the existing bridge over UPRR and RTD to 48th Avenue. Sidewalk approaches, curb ramps and curb returns shall be provided on the south side of the intersection. The Colorado Boulevard and 48th Avenue intersection shall be reconstructed to meet the ADA requirements, as described in this Section 9.

vii. Dual right-turns shall be provided at the Colorado Boulevard intersections with 46th Avenue and Stapleton Drive. Free-flow right-turn movements shall be provided for all rightmost lanes of dual right-turns. The leftmost lanes of the dual right-turns shall be signal controlled. Both lanes of the dual right-turn from southbound Colorado Boulevard to westbound 46th Avenue/I-70 ramp shall be exclusive right turns. An auxiliary lane shall be provided southbound between 48th Avenue and 46th Avenue North, and northbound between the existing bridge over UPRR/RTD and 46th Avenue South. The 46th Avenue/ramp

terminals on the west side shall be aligned with the Stapleton Drive/ramp terminals on the east side to provide for minimum two-lane thru traffic movements across the intersection.

viii. Free right turns shall be constructed at all four quadrants of the Colorado Boulevard interchange. The Developer shall include pedestrian warning signage at each location that includes rectangular rapid flashing beacons (RRFB) and advanced warning signs as shown in the Free Right Turn Pedestrian Signing Exhibit provided in the Reference Documents.

ix. The Developer shall include raised medians to separate the southbound and northbound lanes of Steele Street/Vasquez and Colorado Boulevard within the general limits of the roadways' reconstruction. Sidewalks shall be provided on both sides of Steele Street/Vasquez Boulevard and Colorado Boulevard for the length of the new roadway construction.

d. Holly Street and Interchange Ramp Construction

i. The Developer shall remove and replace the existing I-70 slip ramps located at Dahlia Street and Monaco Street with a new diamond interchange at Holly Street. The new Holly Street interchange shall be developed to allow the I-70 Mainline to pass over Holly Street. Ramp connectivity from Holly Street/Stapleton Drive to the I-70 Mainline shall be provided as eastbound exit, westbound entrance, westbound exit, and eastbound entrance ramps in accordance with the following requirements:

A. Diverging from Stapleton Drive North, the Holly Street westbound entrance ramp shall have a two-lane ramp tapering to a single-lane entrance and acceleration lane including a physical barrier (i.e. roadside barrier or median) to prohibit vehicles from local intersecting streets (Glencoe Street) from entering the westbound entrance ramp to I-70. A minimum of 1,350 feet dual ramp meter queuing, as measured from the ramp meter stop bar to the cross street shall be provided;

B. The Holly Street eastbound exit ramp shall have a single-lane ramp with single-lane exit and deceleration lane merging with Stapleton Drive South with connection to Holly Street that includes a left/thru, two thru lanes, and a right turn lane;

C. The Holly Street westbound exit ramp shall have a single-lane ramp with single-lane exit and deceleration lane merging with Stapleton Drive North with connection to Holly Street that includes a left turn lane, two thru lanes, and a right turn lane; and

D. Diverging from Stapleton Drive South, the Holly Street eastbound entrance ramp shall have a two-lane ramp tapering to a single-lane entrance and acceleration lane. A minimum of 935 feet dual ramp meter queuing, as measured from the ramp meter stop bar to the cross street shall be provided.

ii. Dedicated right-turn lanes shall be provided from northbound and southbound Holly Street to Stapleton Drive, and from eastbound and westbound Stapleton Drive to Holly Street.

iii. Reconstruction of Holly Street at the I-70 Mainline shall include, at a minimum, one thru lane each direction and dual left-turn lanes northbound and southbound to Stapleton Drive, plus one bike lane in each direction. A minimum of 110 feet of left-turn storage shall be provided northbound and southbound approaching Stapleton Drive. Provide a minimum of 250 feet of dual thru-lane capacity for the northbound direction of Holly Street, approaching Stapleton Drive South. The extent of Construction Work on Holly Street shall be as necessary for the

required lane capacity and tapers including the removal of on-street parking per Section 9.4.14. Sidewalks shall be provided on both sides of Holly Street for the length of the new roadway construction.

e. Quebec Street and Interchange Ramp Reconstruction

i. Reconstruction of the I-70 Mainline shall extend to the existing Sand Creek Bridge. Ramp connectivity from Quebec Street to I-70 shall be provided as westbound entrance, eastbound exit, westbound exit, and eastbound entrance ramps.

ii. The Developer shall provide new I-70 ramp connections for the westbound entrance and eastbound exit ramps in accordance with the following requirements:

A. The Quebec Street westbound entrance ramp shall provide a minimum 724 feet dual ramp meter queuing, as measured from the ramp meter stop bar to the cross street. The two lane ramp shall be combined with an entrance lane to new westbound Stapleton Drive North. The ramp shall include a two-lane ramp entrance and two-lane acceleration to I-70;

B. The Quebec Street eastbound exit ramp shall have a two-lane exit with two-lane deceleration and ramp. Merging of the ramp with eastbound Stapleton Drive South shall be provided in advance of a two-lane ramp terminal at Quebec Street that includes a left, a left/thru, a thru, and a right turn lane;

C. The Quebec Street westbound exit ramp shall have a two-lane exit with two-lane deceleration. Ramp connection to Quebec Street shall include a left turn lane, left/thru lane, right/thru lane, and right turn lane to Quebec Street;

D. The Quebec Street eastbound entrance ramp shall provide a minimum 420 feet dual ramp meter queuing, as measured from the ramp meter stop bar to the cross street. The ramp shall transition, following the ramp meter stop bar, to a single lane entrance and acceleration lane. Transition taper to single lane may match that provided in the Reference Design; and

E. Ramps shall be constructed to accommodate the ultimate Quebec Street width in accordance with the Roadway Typical Sections provided in Schedule 10B, Contract Drawings. Accommodation includes providing sufficient vertical grade such that ramp grades do not require reconstruction with expansion of Quebec Street to the ultimate width.

iii. Reconstruction of Quebec Street below the I-70 Mainline shall provide two thru lanes with dual left turn lanes for the full length of the reconstruction between the ramp terminals. The Developer shall include raised medians to separate the southbound and northbound lanes of Quebec Street for the length of the new construction (including north and south of I-70) and to accommodate bridge pier placement, if necessary. The I-70 Mainline bridge over Quebec Street shall be constructed to the Ultimate I-70 configuration. The extent of reconstruction work on Quebec Street shall be as necessary to accommodate the required lane capacities, tapers and vertical clearances. Sidewalks shall be provided on both sides of Quebec Street for the length of the new roadway construction. Coordination with CCD for sidewalk termini locations and connections to existing sidewalk facilities is required.

iv. Free-flow right turn movements shall be provided at the Quebec Street ramp terminal intersections. The ramp terminals on the west side shall be aligned with

the ramp terminals on the east side to provide for minimum two-lane through traffic movements across the intersections.

v. Free right turns shall be constructed at all four quadrants. The Developer shall include pedestrian warning signage at each location that includes rectangular rapid flashing beacons (RRFB) and advanced warning signs as shown in the Free Right Turn Pedestrian Signing Exhibit provided in the Reference Documents.

vi. The Developer's design and construction shall not preclude CCD identified future improvements to Quebec Street as described in Section 1.17 of Schedule 10, Section 1 General.

f. I-270 Eastbound Connection to I-70 Mainline Reconstruction

i. The existing I-270 eastbound Bridge over I-70 Mainline shall be reconstructed to provide a structure compatible with the I-70 Ultimate configuration horizontal and vertical geometry.

ii. The reconstructed I-270 connection shall meet the following requirements:

A. Provide an inside shoulder. The Developer shall provide the necessary inside shoulder width to ensure an acceptable horizontal sight distance;

B. Provide two travel lanes; and

iii. Provide an outside shoulder.

g. Peoria Street and Interchange Ramp Construction

i. Peoria Street shall be reconstructed accommodating new bridge piers for the replacement I-70 Mainline bridge. The Developer shall include a raised median to separate the southbound and northbound lanes of Peoria Street for the length of the new construction and to accommodate bridge pier placement as necessary. The I-70 Mainline bridge and highway approaches over Peoria Street shall be constructed to the Ultimate I-70 configuration. The extent of reconstruction work on Peoria Street shall be as necessary to accommodate the required lane capacities, tapers and vertical clearances. Sidewalk shall be provided on the west side of Peoria Street, and a multi-use path provided on the east side for the length of the new roadway construction.

ii. Ramp connectivity from Peoria Street to the I-70 Mainline shall be provided as westbound entrance, eastbound exit, eastbound entrance, and westbound exit ramps in accordance with the following requirements:

A. The Peoria Street westbound entrance ramp shall provide a minimum 900 feet dual ramp meter queuing, as measured from the ramp meter stop bar to the cross street. The ramp shall transition, following the ramp meter stop bar, to a single lane entrance and acceleration lane;

B. The Peoria Street eastbound exit ramp shall have a two-lane ramp with a two-lane exit connection to the existing Peoria Street eastbound exit ramp;

C. The Peoria Street eastbound entrance ramp shall provide a minimum 875 feet dual ramp meter queuing, as measured from the ramp meter stop bar to the cross street. The ramp shall transition, following the ramp meter stop bar, to a single lane entrance and acceleration lane; and

D. The Peoria Street westbound exit ramp shall remain in its existing configuration.

iii. The Developer's design and construction shall not preclude CCD identified future improvements as described in Section 1.17 of Schedule 10, Section 1 General.

h. Eastbound I-70 Mainline Ramp Connection to Southbound I-225 Widening

i. The I-70 eastbound ramp connection to I-225 southbound shall have three lanes. One lane shall originate from the eastbound Peoria entrance ramp as described in this Section 9 and continue east to merge with southbound I-225. A second lane shall be developed from the I-70 eastbound outside most lane as an exit only to southbound I-225. The third lane shall be developed as a decision lane from the I-70 eastbound General Purpose Lanes to southbound I-225.

ii. The Developer shall widen and provide a ramp connection to southbound I-225 in accordance with the following requirements:

A. Provide an inside shoulder;

B. Provide three travel lanes; and

C. Provide an outside shoulder.

iii. The Developer shall provide an appropriate ramp merge with the existing southbound I-225 lanes. The merge shall be completed in advance of the existing westbound to southbound flyover merge.

i. When islands are required, they shall be sized to efficiently channelize traffic, provide pedestrian ramps and refuge, provide for traffic signal poles, safely cross pedestrians at auto lanes, and allow for urban amenity treatments.

j. Unless otherwise Approved by the Department, all entrance ramps shall be parallel type ramps as defined in the AASHTO A Policy on Geometric Design on Highways and Streets (PGDH).

9.4.3. I-70 Cross Streets

a. UPRR Crossing

The Developer shall reconstruct the I-70 Mainline to pass beneath new UPRR 36th Yard and Service Road bridges. Trackwork required for the bridge reconstruction will be provided by UPRR Railroad Forces as described in Schedule 10, Section 10 Railroads.

b. Cross Streets at I-70 Mainline: York Street to Monroe Street

The Developer shall provide cross street connections over the I-70 Mainline and/or to 46th Avenue including necessary structures, for the following streets:

i. High Street

North of the I-70 Mainline, High Street shall connect to the new local road adjacent to 46th Avenue North.

ii. Race Street

North of the I-70 Mainline, Race Street shall connect to a new local road adjacent to 46th Avenue North. Construction on Race Street shall include a full width mill and overlay to the limits of the new storm drainage pipe and/or Utilities.

iii. Vine Street

North of the I-70 Mainline, Vine Street shall connect to the new local road adjacent to 46th Avenue North.

iv. Gaylord Street

North of the I-70 Mainline, Gaylord Street shall connect to the new local road to adjacent 46th Avenue North.

v. York Street

A. Reconstruction of the street shall provide one lane northbound and one lane southbound (subject to 9.4.3.b.v.C of this Section) from 47th Avenue to 48th Avenue; two lanes southbound and one lane northbound (with adjacent parking lane) from 46th Avenue to 47th Avenue; and three southbound thru lanes from 45th Avenue to 46th Avenue. York Street shall be constructed in accordance with the Roadway Typical Sections provided in Schedule 10B, Contract Drawings, Construction shall not preclude the future conversion of York Street to the Ultimate width and laneage to two southbound and one northbound lane between 44th Avenue to 45th Avenue; two southbound and two northbound lanes between 45th Avenue and 46th Avenue South; and compliance with the requirements provided in Sections 9.4.3.b.v.B thru F of this Section. South of 45th Avenue, achievement of the Ultimate laneage may be accommodated through striping within the existing width. The Construction Work shall be in conformance with the York Street Interim Construction Exhibit provided in the Reference Documents.

B. Construction of a new bridge over the I-70 Mainline shall provide for the future conversion of York Street to two-way with a minimum section of two thru lanes and one left turn lane in each direction. The striping layout for the Project shall provide for two thru lanes southbound and a left turn lane to 46th Avenue South. Additional bridge and reconstructed roadway width shall be constructed to provide the future two-way section. The additional width shall be delineated for non-use by physically separating with curbs, the future two-way section from the Project laneage. Sidewalk shall be provided on both sides of York Street for the length of the new construction.

C. The intersection of York Street and 47th Avenue shall be reconstructed to provide a southbound left turn lane on York Street with a minimum 110 feet of storage north of the UPRR at-grade crossing. Modifications shall also be performed on 47th Avenue to provide a westbound left turn lane with a minimum 180 feet of storage.

D. A free right-turn movement shall be provided from eastbound 46th Avenue to southbound York Street.

E. The UPRR York Street Crossing shall be reconstructed as required to provide the following:

(I) Widened roadway section;

(II) A 10 foot wide pedestrian crossing along the west side;

(III) An 8 foot wide pedestrian crossing along the east side;

(IV) Signalization of the 47th Avenue intersection; and

(V) Track reconstruction, crossing panel replacement and Railroad warning device placement associated with the UPRR trackwork, and in accordance Schedule 10, Section 10 Railroads.

F. The Developer's design and construction of York Street shall be developed to not preclude CCD's proposed planned construction of a pedestrian railroad overpass near 47th Avenue and York Street. Information on the future overpass is provided in the Reference Documents.

vi. Josephine Street

A. Reconstruction of the street shall provide a new bridge over the Lowered Section accommodating three northbound one-way lanes including one left-turn, one left/thru and one thru/right lane. Sidewalks shall be provided on both sides of Josephine Street for the length of the new roadway construction.

B. The Developer's design and construction shall not preclude CCD identified future improvements as described in Section 1.17 of Schedule 10, Section 1 General.

vii. Columbine Street

Columbine Street shall be reconstructed to provide a new bridge over the Lowered Section accommodating two-way traffic, one lane in each direction, and parking lanes as described in the I-70 Cover Plans provided in Schedule 10B Contract Drawings. Sidewalks shall be provided on both sides of Columbine Street for the length of the new roadway construction.

viii. Elizabeth Street

North of the I-70 Mainline, Elizabeth Street will be vacated and incorporated into the Swansea School redevelopment. South of the I-70 Mainline, Elizabeth Street shall be connected with new 46th Avenue South as a curb cut and driveway. Sidewalk connections from Elizabeth Street to new 46th Avenue shall be provided.

ix. Thompson Court

A. North of the I-70 Mainline, Thompson Court shall connect to the new 46th Avenue North providing westbound right turn and southbound left turn connections as the Cover terminus point of 46th Avenue. An alleyway connection to Thompson Court from the existing Elizabeth-Thompson alley shall be provided. The Elizabeth-Thompson alley shall be resurfaced from 47th Avenue to the new alleyway connection.

B. South of the I-70 Mainline, Thompson Court shall be constructed to connect with the new 46th Avenue South. All left and right turns shall be provided to and from 46th Avenue. Sidewalk connections from Thompson Court to new 46th Avenue shall be provided for the length of the new Thompson Court construction.

x. Clayton Street

Reconstruction of the street shall provide a new bridge over the Lowered Section accommodating two-way traffic, one lane in each direction, plus one bike lane in each direction as described in the I-70 Cover Plans provided in Schedule 10B Contract Drawings. Sidewalks shall be provided on both sides of Clayton Street for the length of the new roadway construction.

xi. Fillmore Street

Reconstruction of the street shall provide a new bridge over the Lowered Section accommodating two-way traffic, one lane in each direction with right turn pockets to 46th Avenue developed at each end of the bridge. Sidewalks shall be provided on both sides of Fillmore Street for the length of the new roadway construction.

xii. Milwaukee Street

North of the I-70 Mainline, Milwaukee Street shall connect to new 46th Avenue North, providing a right turn movement to westbound 46th Avenue. South of the I-70 Mainline, Milwaukee Street shall connect to the new 46th Avenue South with

left and right turn movements provided to 46th Avenue. Sidewalk connections from Milwaukee Street to new 46th Avenue shall be provided.

xiii. East 48th Avenue at Vasquez Boulevard

Construction on 48th Avenue, west of Vasquez Boulevard, shall provide an eastbound left turn lane, an eastbound thru lane, and a westbound thru lane, modifying the traffic signal as necessary to accommodate the additional lane. The eastbound left turn lane shall provide a minimum 280 feet of storage. Curb and gutter, and sidewalk shall be provided on both sides for the length of the new roadway construction.

xiv. E 45th Avenue at Steele Street

Construction at the 45th Avenue and Steele Street intersection shall provide a left turn and a full movement lane eastbound, and a left turn-turn lane and a right/thru lane in the westbound direction on 45th Avenue. Along Steele Street, provide a left turn, two thru-lanes, and a right turn lane in the southbound direction, and a left turn lane, a thru-lane, and thru/right lane in the northbound direction.

xv. Cook Street

Construction of the street shall provide a new bridge over the Lowered Section accommodating two-way traffic, one lane in each direction. From approximately 45th Avenue, Cook Street shall be extended north to connect with 46th Avenue South, cross over the I-70 Mainline, and connect to 46th Avenue North with an access provided for future land use on the north side. Sidewalks shall be provided on both sides of Cook Street for the length of the new roadway construction.

xvi. Madison Street

South of the I-70 Mainline, Madison Street shall connect to new 46th Avenue South. Sidewalk connections from Madison Street to new 46th Avenue shall be provided.

xvii. Monroe Street

Reconstruction of the street shall provide a new bridge over the Lowered Section accommodating two-way traffic, one lane in each direction. From approximately 45th Avenue, Monroe Street shall be constructed north to connect with new 46th Avenue South, cross over the I-70 Mainline, connect with new 46th Avenue North, and extend north and east to connect with existing Jackson Street. The new Monroe Street shall function as an extension of Jackson Street and serve as the primary access to those properties south of the I-70 Mainline. Sidewalks shall be provided on both sides of Monroe Street for the length of the new roadway construction.

xviii. East 46th Avenue/Colorado Boulevard Connection to Jackson Street

46th Avenue along the west side of Colorado Boulevard shall be reconstructed as required for the realignment and reconstruction of Colorado Boulevard. The road shall be reconstructed to provide two-way traffic, one lane in each direction with a sidewalk along the west side. The extent of Construction Work on East 46th Avenue shall be as necessary to provide a tie-in on the north end and a connection to Jackson Street from the south end.

c. Cross Streets at I-70 Mainline: Dahlia Street to Peoria Street

The Developer shall provide cross street connections under the I-70 Mainline and/or to Stapleton Drive, including necessary structures, for the following streets:

i. Dahlia Street

Reconstruction of the street shall be sufficient to provide one through lane in each direction with single left-turn lanes to Stapleton Drive under the I-70 Mainline. Bike lanes shall be provided in each direction, and sidewalks provided on both sides of Dahlia Street for the length of the new roadway construction. Shared right/thru lanes shall be provided for right turns at Dahlia Street.

ii. Monaco Street

Reconstruction of the street shall be sufficient to provide one through lane northbound with dual left-turn lanes to Stapleton Drive. Southbound shall provide one left-turn, one left/thru lane, and one thru lane. Sidewalks shall be provided on both sides of the Monaco Street for the length of the new roadway construction. Shared right/thru lanes shall be provided for right turns at Monaco Street.

iii. Forest Street

North of the I-70 Mainline, Forest Street shall connect to new Stapleton Drive North. Right-in and right-out turn movements shall be provided. South of I-70, Forest Street shall connect to new Stapleton Drive South. Right-in and right-out turn movements shall be provided.

iv. Glencoe Street

North of the I-70 Mainline, Glencoe Street shall connect to new Stapleton Drive North. Right-in and right-out turn movements shall be provided. South of the I-70 Mainline, Glencoe Street shall connect to new Stapleton Drive South. Right-in and right-out turn movements shall be provided.

v. Grape Street

North of the I-70 Mainline, Grape Street shall connect to new Stapleton Drive North. Right-in and right-out turn movements shall be provided. South of the I-70 Mainline, Grape Street shall connect to new Stapleton Drive South. Right-in and right-out turn movements shall be provided.

vi. Ivy Street

North of the I-70 Mainline, Ivy Street shall connect to new Stapleton Drive North. Right-in and right-out turn movements shall be provided.

vii. Kearney Street

South of the I-70 Mainline, Kearney Street shall connect to new Stapleton Drive South. Right-in and right-out turn movements shall be provided.

viii. Leyden Street

North of the I-70 Mainline, Leyden Street shall connect to new Stapleton Drive North. Right-in and right-out turn movements shall be provided.

ix. Oneida Street

South of the I-70 Mainline, Oneida Street shall connect to new Stapleton Drive South. Right-in and right-out turn movements shall be provided.

x. Airlawn Road

South of the I-70 Mainline, Airlawn Road shall connect to new Stapleton Drive South.

xi. At each intersection, curb returns shall be constructed to meet the design vehicle requirements listed in Appendix A Roadway Design Criteria to this Section 9. The

Developer shall provide sidewalk connections from new construction to all existing adjacent cross street sidewalks.

xii. Extents of Construction Work on all cross streets and connection streets shall be as necessary to accommodate the required lane capacity, tapers and tie-ins.

9.4.4. 46th Avenue and Stapleton Drive

a. 46th Avenue North and 46th Avenue South: Brighton Boulevard to Colorado Boulevard

i. 46th Avenue shall be reconstructed as a collector street to provide east-west connectivity from Brighton Boulevard to York Street and from Steele Street/Vasquez Boulevard to Colorado Boulevard. Local access to adjacent neighborhoods shall be provided between York Street to Steele/Vasquez Boulevard.

ii. The Developer shall construct 46th Avenue in accordance with the following street network connectivity requirements:

A. Brighton Boulevard to York Street

(I) Provide two lane one-way operations westbound from York Street. 46th Avenue merges and is combined with the westbound exit ramp to Brighton Boulevard. Provide a continuous sidewalk along the outside of 46th Avenue North from York Street to Brighton Boulevard including a minimum 10 foot wide sidewalk under the UPRR bridge. Sidewalk width applications described in this Section 9 shall apply for all sidewalk outside of the UPRR bridge. Westbound sidewalk under the UPRR bridge shall be separated vertically, from 46th Avenue, by a minimum of 34 inches. Provide all necessary pedestrian handrail protection.

(II) Provide two lane one-way operations eastbound for 46th Avenue South from the divergence point with the eastbound Brighton Boulevard entrance ramp to York Street. The eastbound approach to York Street, for the Ultimate configuration, shall include one left/thru lane, one thru lane and one right-turn lane. The eastbound approach to York Street, for the Project, shall include one thru lane and one right/thru lane. Provide a continuous minimum 10 foot wide sidewalk on the outside of 46th Avenue. Eastbound sidewalk under the UPRR bridge shall be separated vertically, from 46th Avenue, by a minimum of 34 inches. Provide all necessary pedestrian handrail protection.

B. York Street to Columbine Street

(I) Along the north side, 46th Avenue North shall be two lanes one-way westbound from York Street to Josephine Street. Between Josephine Street and Columbine Street, 46th Avenue shall be one lane each direction (two-way operations). A raised refuge area shall be provided between the edge of lane and barrier as depicted in the Roadway Typical Sections.

(II) Along the south side, 46th Avenue South shall be two lanes one-way eastbound from York Street to Josephine Street. Between Josephine Street and Columbine Street, 46th Avenue shall be one lane each direction (two-way operations), with a left turn lane from 46th Avenue eastbound to Columbine Street northbound. A raised refuge area shall be provided between the edge of lane and barrier as depicted in the Roadway Typical

Sections. The Developer shall provide a continuous sidewalk on the north side of 46th Avenue North and south side of 46th Avenue South for the length of the new roadway construction.

C. Columbine Street to Clayton Street

(I) Along the north side, 46th Avenue shall be discontinuous between Columbine Street and Thompson Court. A two-lane, two-way connection with attached sidewalk shall be provided between Thompson Court and Clayton Street as described in the I-70 Cover Plans provided in Schedule 10B Contract Drawings. An alleyway connection shall be provided from Thompson Court to the existing Elizabeth-Thompson alley including reconstruction of the alley from 46th Avenue North to 47th Avenue.

(II) On the south side, 46th Avenue shall include one lane each direction (two-way operations) with a left turn lane pockets for Columbine and Elizabeth Street access from westbound 46th Avenue. The Developer shall integrate 46th Avenue South with the design of the Cover as necessary to work within ROW constraints and meet the requirements of the I-70 Cover Plans as provided in Schedule 10B Contract Drawings. This includes aesthetics, parking lanes, sidewalks, landscaping and other considerations as required.

D. Clayton Street to Milwaukee Street

(I) Provide one lane each direction (two-way operations) on 46th Avenue North with a left turn lane to Fillmore Street from westbound and eastbound 46th Avenue. A raised refuge area shall be provided as depicted in the Roadway Typical Sections.

(II) On 46th Avenue South, provide one lane each direction (two-way operations) with a left turn lane to Fillmore Street from eastbound and westbound 46th Avenue. A raised refuge area between the edge of pavement and barrier shall be provided as depicted in the Roadway Typical Sections. The Developer shall provide a continuous sidewalk on the south side 46th Avenue South and north side of 46th Avenue North for the length of the new roadway construction.

E. Milwaukee Street to Steele Street/Vasquez Boulevard

The Developer shall provide one lane one-way connections westbound on 46th Avenue North and eastbound on 46th Avenue South to and from merge points with the Steele/Vasquez ramps. A raised refuge area shall be provided as depicted in the Roadway Typical Sections. Sidewalks shall be provided on the south side 46th Avenue South and north side of 46th Avenue North to connect with the sidewalks along Steele Street/Vasquez Boulevard.

F. Steele Street/Vasquez Boulevard to Colorado Boulevard

In this segment, 46th Avenue North and South are incorporated as split diamond interchange connecting roadways designed as collector-distributor roadways. On 46th Avenue North, provide two westbound lanes with a minimum four foot shoulder to the barrier. On 46th Avenue South, provide two eastbound lanes with a minimum four foot shoulder to the barrier. The Developer shall provide a continuous sidewalk on the south side 46th Avenue South and north side of 46th Avenue North for the length of the new roadway construction.

iii. Alleyway connections shall be provided at all existing alleys that currently intersect 46th Avenue.

b. Stapleton Drive North and Stapleton Drive South: Colorado Boulevard to Quebec Street

i. Stapleton Drive North and South shall be reconstructed as one-way collector street to provide east-west connectivity from Colorado Boulevard to Quebec Street, and local access to adjacent neighborhoods and commercial districts.

ii. The Developer shall design and construct Stapleton Drive in accordance with the following street network connectivity requirements:

A. Colorado Boulevard to Dahlia Street

Provide two lanes eastbound on Stapleton Drive South diverging from the Colorado Boulevard entrance ramp and extending east to Dahlia Street. Provide two lanes westbound on Stapleton Drive North from Dahlia Street, tapering to a single lane to merge with the Colorado Boulevard exit ramp and intersecting with Colorado Boulevard. The Developer shall also provide a one-lane westbound local access road from Dahlia Street to connect to the existing East 46th Avenue near the Colorado Boulevard interchange.

B. Dahlia Street to Monaco Street

Provide two lanes eastbound on Stapleton Drive South from Dahlia Street to the merge with the Holly Street exit ramp. Provide four lanes connecting to Holly Street, and three lanes extending east from Holly Street. Provide a minimum one lane eastbound from the Holly Street entrance ramp divergence point with a transition to a two-lane approach and connection to Monaco Street. On Stapleton Drive North, provide two lanes westbound from Monaco Street to the merge point with the Holly Street exit ramp. Provide a four lanes to intersect with Holly Street, and two lanes westbound to the divergence point with the Holly Street entrance ramp. Provide a minimum one lane from the divergence point west, with a transition to a two-lane approach and connection to Dahlia Street.

C. Monaco Street to Quebec Street

Provide two lanes minimum eastbound on Stapleton Drive South from Monaco Street to the divergence point for the Quebec Street eastbound exit ramp connection. Provide a minimum one lane eastbound to the merge point with the Quebec Street eastbound exit ramp and a minimum one lane eastbound to Oneida Street. Provide one lane each direction (two-way operations) on Stapleton Drive South between Oneida Street and Airlawn Road. On Stapleton Drive North, provide a minimum one lane westbound from the divergence point with the Quebec Street westbound entrance ramp to the first commercial property driveway. From the first commercial driveway, provide two lanes westbound to the intersection with Monaco Street.

9.4.5. Sidewalks

a. Unless otherwise directed in this Section 9, sidewalks along all CDOT Roadways and Local Agency Roadways shall be provided by the Developer in accordance with the widths and configurations in the Roadway Typical Sections as shown in Schedule 10B Contract Drawings. A preliminary design for sidewalks is shown in the Sidewalk Exhibit provided in the Reference Documents. Sidewalks designs shall be refined and optimized as a result of the Developer's design and submitted for Acceptance as part of plan submittals.

b. Unless otherwise directed in this Section 9, sidewalks, in widths of not less than five feet, shall be provided along both sides of reconstructed cross street tie-ins to match existing widths with detachment areas as necessary to match existing. Cross streets tie-ins including cross streets without existing sidewalk shall have sidewalk provided for the length of the reconstructed area in accordance with Local Agency standards, or as depicted in the Sidewalk Exhibit provided in the Reference Documents.

9.4.6. Coordination with Recent I-70 Reconstruction Projects

a. I-70 over Havana Street Design-Build Project (2015):

i. The Havana Street Design-Build Project, I-70 over Havana Street, is under construction. The construction work under the Havana Street Design-Build Project includes a new bridge over Havana Street, a new I-70 bridge over the future relocated UPRR spur track, earthwork, guardrail and pavement approaches to the bridges at each end. All Elements of the Havana Street Design-Build Project will be constructed independently of the Project. The bridges constructed under the Havana Street Design-Build Project will be compatible with the Ultimate configuration. It is acceptable to maintain the Havana Street Design-Build Project centerline alignment for the Project;

ii. The Developer shall make any required modifications to these completed improvements to accommodate the integration and completion of the Construction Work. This will likely include striping, signing, barrier/guardrail transitions, embankment transitions, walls, and any other incidental/miscellaneous work required;

iii. The Havana Street westbound entrance ramp shall provide a minimum 865 feet dual ramp meter queuing, as measured from the ramp meter stop bar to the cross street. The ramp shall transition, following the ramp meter stop bar, to a single lane entrance and acceleration lane to I-70; and

iv. See the Reference Documents for the Havana Street Design-Build Project plans.

b. I-70 over Sand Creek Bridge Replacement (2011):

i. The Department replaced the I-70 structure over Sand Creek in 2011. While significant alterations are expected necessary for the Ultimate configuration, minor or no alterations are expected to the bridge as part of the Project; and

ii. See the Reference Documents for Sand Creek Bridge As-Built plan information.

9.4.7. Local Agency Roadway Infrastructure

The Construction Work includes the design and construction, reconstruction and closure of Local Agency Roadways. The intended configuration of these arterial, collector, and local roadways is depicted as a guide in the Reference Design drawings, conveying the general intent of the Construction Work. Local Agency Roadway improvements are defined as follows:

a. Local Agency Roadway Limits

The limits of Local Agency Roadway improvements shown in the Reference Design drawings are approximate only and shall be extended as necessary for completion of the Construction Work, including but not limited for the need to provide smooth horizontal/vertical transitions, meet ADA requirements, and other miscellaneous improvements.

b. Geometric Roadway Alignments

The horizontal and vertical alignments for the Local Agency Roadways may be changed unless otherwise prohibited by the Project Agreement. However, implementation of any proposed change must be achievable within the ROW.

c. Number of Lanes

The minimum number of lanes shall be the number depicted in the Roadway Typical Sections as shown in Schedule 10B Contract Drawings.

d. Intersections

The intersection configurations for the Local Agency Roadways depicted in the Reference Design drawings may be changed unless otherwise prohibited by the Project Agreement. The Developer may propose and submit modifications, with updated traffic modeling for the proposed modifications, to the number of turn lanes and lane storage lengths during design development for approval by the Local Agency. The proposed modifications shall comply with the Project's traffic operational performance requirements that include reasonable expectations for travel times, safety, mobility, and User satisfaction. Any paving Construction Work extending into an intersection shall require a mill and overlay of the existing pavement extending to each curb return within the intersection.

e. Intersection Turning Movement Design

Curb returns shall be constructed to meet the design vehicle requirements listed in Appendix A Roadway Design Criteria to this Section 9. The Developer shall analyze the likely paths and encroachments that may result when a turn is made by the design vehicle. The Developer shall optimize these designs and coordinate with CCD for all curb return designs. Turning movement and curb return designs shall account for:

i. Where constraints require, the design vehicle turning movements may utilize receiving lanes;

ii. Where double left turns are implemented, simultaneous turning movements of the design vehicle are not required; and

iii. Consideration of curb ramp locations and best practices for pedestrian/bike/handicap designs shall be implemented.

f. 46th Avenue/Stapleton Drive and I-70 Ramps Merge/Weave Design

The Developer's design shall optimize the design of the merge/weave section between of 46th Avenue/Stapleton Drive and the I-70 ramps. Strategies to implement shall include the following:

i. Providing the maximum weave length between the merge point of 46th Avenue/Stapleton Drive and the I-70 ramp to the adjacent intersecting cross-street;

ii. Additional (above minimum MUTCD requirements) advance directional signing and striping strategies;

iii. Turning movement restrictions where warranted for safety and as approved by the CCD; and

iv. Coordinate with CCD to optimize these designs.

g. Pedestrian Movement Design

The Developer shall be responsible for the design of pedestrian movements, including crossing locations, ramps and signals along all relevant portions of the Project (including Local Agency Roadways). It is the goal of the Project to apply context sensitive pedestrian design in order to optimize pedestrian crossing movements at intersections while not significantly degrading vehicle operations. Pedestrian movements design shall consider locations of curb ramps to provide optimal sight distance and shortest route as well as requirements for all crossings at signalized intersections to be protected wherever possible. It is the desire of the Local Agency to avoid the use of directional islands and free right turn vehicle movements where possible to achieve an acceptable intersection

level of service. The Developer shall avoid the use of free right turn vehicle movements, unless otherwise required in this Section 9.

h. Bus Stop Locations

i. Bus stops to be located along 46th Avenue and other Local Agency Roadways shall be at the direction of and in coordination with the Regional Transportation District (RTD) and CCD. The Developer shall work with RTD and CCD to provide bus stops as directed. RTD's design standards shall be used for the design of all bus stops that will be part of the Construction Work. RTD will provide materials, including benches, signage and shelters to the Developer for all bus stops within the Site at no cost to the Project.

ii. The Developer shall deliver any existing RTD bus stop amenities (benches, shelters, etc.) removed during the course of the Construction Work to RTD as directed by RTD. If agreed with RTD, the Developer may reuse existing amenities at new locations in the Work or dispose of the existing bus stop amenities.

i. Local Agency Roadways shall meet minimum flowline to flowline roadway widths, as specified in CCD Rules & Regulations for Standard Right-of-Way Cross Sections and Utility Locations.

j. Section 12 (other than Sections 12.2.a and b) of the Project Agreement shall apply to the Denver Planned Projects listed in Appendix B Denver Planned Projects to this Section 9.

9.4.8. Americans with Disabilities Act

Without prejudice to any additional Local Agency standards with which the Developer is obliged to comply, the Developer shall produce ADA compliant design for Acceptance by the Department as part of the design plans. The Developer shall include a letter with each Release for Construction submittal demonstrating that the Project complies with all applicable ADA requirements.

a. Where curb ramps are to be removed and reconstructed, the Developer shall provide and maintain an alternate ADA-compliant pedestrian access route at all times.

b. Additional ADA requirements are as follows:

i. Within the limits of the Construction Work, the Developer shall reconstruct all pedestrian facilities including curb ramps, sidewalks, and driveways to meet ADA requirements; and

ii. Any Construction Work that disturbs any portion of an intersection shall require the entire intersection be reconstructed as necessary to meet ADA requirements, regardless if this involves work outside of the Site. In locations outside of the Site only, the Developer may evaluate existing conditions and provide documentation for Acceptance that the existing infrastructure is ADA compliant.

9.4.9. Cross Slope and Superelevation

a. Normal Cross Slope

i. Except as and to the extent otherwise provided with respect to the "ATC 18.1 Modifications" (as such term is defined in Part B of Schedule 28 (*Proposal Extracts*)) pursuant to Section 1(e) of Part B of Schedule 28 (*Proposal Extracts*), all new and reconstructed pavement sections shall have a minimum normal cross slope of two percent across the inside shoulder and travel lanes, with a minimum cross slope of two percent across the outside shoulder;

ii. For pavement widening sections, the widened travel lanes shall have a minimum normal cross slope of two percent. Outside shoulders located within the pavement widening sections shall meet AASHTO PGDH criteria; and

iii. For overlay sections (locations per Schedule 10 Section 6.6.7), where the existing cross slope is equal or greater than two percent, the Developer shall maintain the existing pavement cross slope. For overlay sections (locations per Schedule 10 Section 6.6.7), where the existing cross slope is less than two percent, the cross slope shall be built up through the use of a variable thickness overlay to a minimum of two percent.

b. Superelevation Rates

Superelevation runout and runoff lengths for I-70, I-270, and interchange ramps shall be designed to comply with the design criteria and methodology of the AASHTO PGDH and as described in Appendix A Roadway Design Criteria to this Section 9. Adjustments to superelevation transition rates and locations necessary to ensure adequate surface drainage will require Acceptance by the Department as part of the plan submittals in accordance with Schedule 9 Submittals.

9.4.10. Stopping Sight Distance

Stopping sight distances and decision sight distances shall meet the minimum requirements of Appendix A Roadway Design Criteria to this Section 9. Stopping sight distances shall be determined in accordance with AASHTO PGDH.

9.4.11. Fill and Cut Slopes and Clear Zones

(Note: All slopes stated herein are in terms of horizontal:vertical)

a. The Developer shall design cut and fill slopes to obtain roadside clear zones in accordance with the AASHTO Roadside Design Guide, and avoid the need for guardrail wherever possible. Where clear zones cannot be obtained within the ROW, guardrail shall be required.

b. The Developer shall provide a maximum 3:1 traversable surface for slope maintenance and vehicle access on all vegetated slopes where flatter slopes are not achievable. The minimum slope on fill and cut slopes shall be 6:1.

c. Roadside slopes shall be designed and constructed to meet the following requirements as defined in Appendix A Roadway Design Criteria to this Section 9.

d. Roadside Slopes Adjacent to Pavement

i. The Point of Slope Selection (POSS) is defined as the location at which the roadside slope adjacent to the pavement, known as the Z-slope ends, and the cut, or fill slope begins. Width and slope of the area between the edge of pavement (or sidewalk) and the POSS shall be as follows:

A. I-70: 18 feet minimum at a 6:1 slope; and

B. Ramps: 12 feet at a 6:1 slope.

e. Fill Slopes

i. Fill slopes beyond the POSS shall be designed and constructed in accordance with the following priority:

A. Use 6:1 slopes where fill heights are less than four feet and can match to existing surface conditions within the ROW;

B. Use 4:1 slopes where fill heights are greater than four feet but less than 15 feet and can match to existing surface conditions within the ROW;

C. Use 3:1 slopes where fill heights are less than 15 feet, but slopes steeper than 4:1 are required to match existing surface conditions within the ROW;

D. Use 3:1 slopes where fill heights exceed 15 feet, clear zone Z-slope can be obtained, and slopes can match to existing surface conditions within the ROW;

E. Where the above requirements in this subsection cannot be met, the Developer may use any of the following design approaches:

(I) Use 3:1 to 2.5:1 slopes with guardrail protection. Slopes steeper than 3:1 shall be limited to areas where slopes are transitioning to match slope paving at bridge abutments, or where transitioning to match existing slopes steeper than 3:1. Slopes of 2.5:1 to 3:1 shall comply with the slope stabilization requirements of Schedule 10, Section 7 Earthwork; or

(II) Use retaining walls as necessary, with guardrail protection where required.

ii. Fill slope areas shall be designed with ditches and storm sewer as necessary to prevent untreated roadside and slope drainage from flowing off the ROW to adjacent properties; and

iii. All fill slopes shall be rounded at the toes or ties to existing ground.

f. Cut Slopes

i. Cut slopes beyond the POSS shall be designed and constructed in accordance with the following priorities:

A. Cut slopes shall be transitioned at the POSS in such a manner to comply with the recommendations of the AASHTO Roadside Design Guide;

B. Use 4:1 or flatter slopes for cut slopes where the slope can match with existing surface conditions within the ROW;

C. Use 3:1 slopes for cut slopes where slopes steeper than 4:1 are necessary to obtain the match to existing surface conditions within the ROW;

D. Where the above conditions cannot be obtained, the Developer may use any of the following design approaches:

(I) If a full clear zone Z-slope cannot be provided, use 3:1 if the POSS is at least 10 feet from the edge of pavement; or

(II) If a full clear zone Z-slope cannot be provided within the ROW, use 3:1 to 2.5:1 slopes with guardrail protection if the POSS is at less than 10 feet from the edge of pavement. Slopes steeper than 3:1 shall be limited to areas where slopes are transitioning to match slope paving at bridge abutments or where transitioning to match existing slopes steeper than 3:1.

(III) Use retaining walls as necessary, with guardrail protection to match existing conditions.

ii. Cut slopes and associated ditches shall be designed as necessary to prevent untreated roadside and slope drainage from flowing off ROW to adjacent properties.

iii. All cut slopes shall be rounded at their matches to existing ground.

9.4.12. Barrier and Guardrail

a. Barrier or guardrail shall be required wherever clear zone requirements cannot be achieved.

b. Median barrier is required along the entire length of the I-70 Mainline reconstruction and widening areas. Median barrier shall be Type 7 concrete barrier with a concrete glare screen in accordance with CDOT Standard M-606-13.

c. Two 16 feet wide openings with crash attenuators shall be provided for maintenance / emergency cross-over access in the median barrier, located at the limit of the solid concrete pier wall that extends beyond both ends of the Cover, in accordance with Schedule 10 Section 13.6.3.

d. Existing concrete median barrier to be replaced shall include, but may not be limited to, the following locations:

i. From the western limit of I-70 Mainline reconstruction at Brighton Boulevard to the Washington Street bridge. The new barrier shall be designed and built to accommodate the existing drainage inlets;

ii. From the eastern construction limit of I-70 Mainline widening at I-225 to approximately 2,800 feet east; and

iii. The Developer shall replace existing median barriers within ETC and ITS infrastructure locations outside I-70 Mainline reconstruction and locations provided in accordance with Sections 9.4.12.c.i and 9.4.12.c.ii.

e. Guardrail along the outside shoulders of the I-70 Mainline shall be concrete barrier where inlets are required for pavement drainage. Type 3 guardrail with asphalt curb will not be permitted for drainage accommodation.

f. All concrete barrier shall be cast-in-place. Precast barrier will not be accepted for permanent installations.

g. Crash attenuators and rail end treatments shall be provided at all required locations where barrier/guardrail begins or ends in accordance with the CDOT Safety Guide, Standards M-606-1 and M-606-13 and Chapter 8 of the AASHTO Roadside Design Guide.

h. Concrete barrier with fence, in accordance with the Aesthetic Design Standards for Central 70 in Schedule 10B Contract Drawings, shall be provided between 46th Avenue and the Lowered Section where noise walls or the Cover are not provided. At locations of proposed noise walls incorporate barrier requirements as part of the wall design.

i. Concrete barrier with 36 inch splashguard fence, in accordance with *CDOT Worksheet B-607-3*, shall be provided between Stapleton Drive and I-70, between Colorado Boulevard and Sand Creek Bridge.

j. All new Type 7 concrete barrier shall include a concrete glare screen. Concrete glare screen shall be poured monolithically with the construction of new concrete barrier.

9.4.13. Driveways and Access Design

a. All private property parcels require access to public ROW. The Developer shall construct connecting roads, driveways and curb cuts to provide access to private property, or connect streets with alleyways where existing access is disturbed or reconfigured and requires relocation. Access design and location shall conform to the following requirements, in the order of precedence listed:

i. CDOT Roadways

A. CDOT access control lines (or A-Line) restrictions; and

B. State of Colorado, State Highway Access Code.

ii. Local Agency Roadways

A. CDOT access control lines (or A-Line) restrictions; and

B. CCD Permit Requirements and Municipal Codes.

b. Private property accesses from roadway ROW shall be designed and constructed using curb cuts. All public roadway connections shall be designed and constructed using curb returns.

c. Connecting roads and driveways shall be paved to the ROW limits in accordance with pavement requirements defined by the Local Agency. Connecting roads and driveways shall be replaced in kind as required beyond the ROW line to the limits necessary to match existing grade. Curb return openings that are provided for future connections shall be paved through the curb returns.

d. Alley cuts shall accommodate trash truck turning movements.

9.4.14. On-Street Parking Removal

There are locations that require the removal of existing on-street parking in order to comply with the requirements under the Project Agreement. The Developer shall coordinate with the City of Denver and obtain approvals meeting the Local Agency requirements and municipal codes in relation to such removal. The Developer shall coordinate with property owners where on-street parking is removed and shall complete the necessary public information process as part of the Construction Work with assistance from the City of Denver.

9.4.15. Design Exceptions

a. Identified Design Exceptions

The Department has obtained approval from FHWA for the design exceptions shown in Table 9-1. The Developer may use the design exceptions to optimize designs to reduce the impacts to adjacent neighborhoods and businesses. Design exceptions 2 and 3 in Table 9-1 are additionally subject to Schedule 18 Section 1.3.2.d Special Provisions for ROW Parcel RW-103 to provide maximum additional buffer space between the highway and residential properties north of I-70 between Brighton Boulevard and Steele Street/Vasquez Boulevard and to Safeway Historic District south of I-70 between Colorado Boulevard and Dahlia Street. Approval of additional or revised design exceptions required for the Developer's design are the responsibility of the Developer to obtain in accordance with the requirements below.

b. Design Exception Process (for additional or revised design exceptions from FHWA)

The Developer shall comply with the following requirements when requesting a design exception:

i. The Developer shall submit to the Department for Approval five copies of design exception requests in letter form; and

ii. The design exception request submittals shall consist of the following items:

A. A letter identifying the exception(s) by number, Project number, location, and status (new submittal, resubmittal, etc.);

B. A completed CDOT Form 464a;

C. Supporting documentation indicating the justification for the exception. Justification shall address the following items:

(I) Site conditions of the exception;

(II) Compelling reason for the exception, including which standard is not being met, if the exception affects any other standards, and what will be done to mitigate the effects of the exception;

(III) Effects of the exception on safety and operation of the facility;

(IV) Previous crash history near the location of the exception;

(V) Calculations estimating the cost of attaining the design standard and costs of exception as proposed;

(VI) Effect on scenic, historical, or other environmental features; and

(VII) Effect of operations and safety to the facility;

D. Plan and profile drawings depicting the exception;

E. Modification to submittals to address comments and additional information as requested by the Department or FHWA.

Approval of any request from the Developer to the Department to submit a request to FHWA, and any request submitted to FHWA, in either case, for approval of a design exception shall be at the discretion of the Department or FHWA.

c. Possible Additional Design Exceptions

i. The Reference Design acknowledges certain conflicts that exist within the design as shown (as specified in Section 9.4.15.c.ii) that, without alterations, require additional design exceptions be requested by the Developer from FHWA. It shall be the Developer's responsibility to evaluate the Reference Design as shown, identify design conflicts, and make appropriate alterations to the design, or request design exceptions in accordance with the procedures listed above. The Developer shall make all efforts in its design to eliminate the need for design exceptions, wherever possible. The FHWA may request modifications to the design to improve the design exception and the Developer shall work with FHWA to accommodate requested design modifications.

ii. The following design conflicts are acknowledged within the Reference Design:

A. Outside shoulder width on the eastbound I-70 on the Sand Creek bridge

Available width for outside shoulder does not meet minimum shoulder width requirements.

B. Brighton Boulevard horizontal curvature south of I-70

The horizontal curve geometry on Brighton Boulevard south of I-70 shall match the existing constructed roadway. CCD supports this geometry and a design variance is not required for geometry that matches existing conditions at this location.

d. Local Agency Design Variances

Approval of design variances required for the Developer's design, in respect to Local Agency Roadways, shall be obtained by the Developer in accordance with the relevant Local Agency's standard procedures.

Table 9-1 Identified Design Exceptions

No.	Item	Design Criteria	Design Exception	Comments
DE-1	A reduced inside shoulder width on I-70 between I-25 and Brighton Boulevard	12 feet	4 feet (2 feet at lighting and sign structures)	Exception required to stripe Tolled Express Lane within existing wide shoulder.
DE-2	A reduced inside shoulder width on I-70 between Brighton Boulevard and Steele Street/Vasquez Boulevard	12 feet	10 feet (8 feet at bridge piers, lighting and sign structures)	Exception for reduced I-70 footprint.

No.	Item	Design Criteria	Design Exception	Comments
DE-3	A reduced inside shoulder width on I-70 between Steele Street/Vasquez Boulevard and Dahlia Street	12 feet	10 feet (8 feet at bridge piers, lighting and sign structures)	Exception for reduced I-70 footprint.
DE-4	A reduced inside shoulder width on I-70 between east of the I-70 bridge over Sand Creek to east of Peoria Street	12 feet	8 feet (6 feet at bridge piers, lighting and sign structures)	Exception to add a Tolled Express Lane on the inside of an existing highway section with minimal widening.
DE-5	A reduced inside shoulder width on the I-70 bridge over Sand Creek and on I-70 from east of Peoria Street to Chambers Road	12 feet	4 feet (2 feet at lighting and sign structures)	Exception to add a Tolled Express Lane on the inside of the existing highway section with minimal widening.
DE-6	A reduced outside shoulder width on I-70 with a capped hard surface from east of Sand Creek Bridge to east of Peoria Street	12 feet	8 feet outside shoulder width with 4 feet capped hard surface	Exception to add a Tolled Express Lane on the inside of the existing highway section with minimal widening.

9.5. Construction Requirements

9.5.1. Removals

The Developer shall be responsible for the removal of all items within the Site not incorporated into the Construction Work. Removal items shall become the property of the Developer unless identified during the design review to remain property of the Department, CCD, or other agency. Removal items shall include, but not be limited to structures/portions of structures and obstructions, retaining walls, signs designated for removal, pavements, curbs, excavation, guardrail, fencing, landscaping, and pavement markings.

a. Roadways

The Developer shall remove abandoned portions of roadways and roadway fills reconstructed as a part of the Construction Work. The Developer shall smooth the area to blend into adjacent terrain, and topsoil and seed.

b. Buried Foundations

Buried foundations from abandoned structures are believed to exist within the Project Site. Specifically, the buried foundations from the original Swansea Elementary School and pedestrian underpass located near 46th Avenue and Columbine Street. The Developer shall remove and backfill as necessary all buried foundations found to be in conflict with the Construction Work.

9.5.2. Guardrail

The Developer shall use galvanized guardrail (CDOT Standard Plan No. M606-1) with steel posts and composite block for guardrail installations which are not required to be concrete, unless otherwise Approved by the Department. The Developer shall pave asphalt a minimum of one foot behind the new guardrail in accordance with the CDOT *M & S Standard Plans*.

9.5.3. Fencing

a. Temporary Fencing

The Developer shall provide temporary fencing as required by property acquisition agreements to protect adjacent private property. In remaining areas, temporary fencing should be considered to control construction operations beyond ROW and construction limits. Temporary fence shall also be placed to protect sensitive environmental resources, as required by Schedule 17 Environmental Requirements.

b. Permanent Fencing

The Developer shall provide permanent fencing of types at the following locations. Permanent fencing shall be compatible with Schedule 10, Section 14 Landscaping and Aesthetics.

i. South side ROW line from Brighton Boulevard to York Street (along Purina property);

ii. North side ROW line along new CDOT/DRIR ROW line; and

iii. Water quality/detention ponds (where required).

c. Privacy Fencing

The Developer shall provide wood privacy fencing along the new 46th Avenue ROW line at all residential properties.

i. The Developer shall coordinate with property owners and obtain any agreements or permits required for the Construction Work;

ii. The fence shall be located on private property wherever possible and the Developer is required to identify the Person that is responsible for maintenance (e.g. the relevant residential property owner);

iii. If the fence is located within CCD ROW, then the Developer is required to obtain an Encumbrance Permit from CCD; and

iv. The Developer shall comply with CCD municipal Zoning Code requirements.

d. Gates

The Developer shall provide gates in fences at locations and of width and type as specified by the Department or maintaining entities for maintenance access. Meet Local Agency standards for location from the ROW and/or back of sidewalk.

e. Railroad Fencing

The Developer shall comply with the requirements set out in Section 10.4.17 of this Schedule 10 in relation to fencing in respect of Railroad work.

9.6. Deliverables

At a minimum, the Developer shall submit the following to the Department for Information, Acceptance, or Approval in accordance with the specified timeframes:

Table 9-2 Deliverables

Deliverable	Information, Acceptance, or Approval	Schedule
Design exceptions	Approval	Prior to RFC Documents

9.7. Appendices

Appendix A Roadway Design Criteria

Appendix B Denver Planned Projects

Appendix A
Roadway Design Criteria

I-70 Mainline				
Design Element	**I-25 to Sand Creek (Project and Ultimate)**	**Sand Creek to Chambers Road (Project)**	**Sand Creek to Tower Road (Ultimate)**	**Remarks**
Standards Applied	CDOT/FHWA			
General				
Roadway Classification	Interstate	Interstate	Interstate	
Posted Speed (MPH)	55	55	-	
Design Speed (MPH)	60	65	70	
Design Vehicle	WB-67	WB-67	WB-67	
Horizontal Alignment Criteria				
Curve Radius (Feet) - Minimum	1,330	1,660	2,040	
Stopping Sight Distance (Feet) - At level grade	570	645	730	
Cross Slope	2%	2%	2%	
Superelevation (e_{max})	6%	6%	6%	
Clear Zone on Tangent (Feet)				
Minimum	30	30	30	Apply curve factors, as required, Per RDG
Desirable	34	34	34	
Lane Widths (Feet)	12	12	12	
Shoulder Widths (Feet) [7]				
Inside	12	12	12	
Outside	12	12	12	
Auxiliary Lanes	6	8 + 4[6]	12	
Side Slopes				
Cut Slope	Equal to or Flatter than 3:1	Equal to or Flatter than 3:1	Equal to or Flatter than 3:1	
Fill Slope	Equal to or Flatter than 4:1 (H<15)	Equal to or Flatter than 4:1 (H<15)	Equal to or Flatter than 4:1 (H<15)	
Z-slope Dist (6:1 Slope) (Feet)	18	18	18	

I-70 Mainline				
Design Element	**I-25 to Sand Creek (Project and Ultimate)**	**Sand Creek to Chambers Road (Project)**	**Sand Creek to Tower Road (Ultimate)**	**Remarks**
Vertical Alignment Criteria				
K-Values				
Crest Vertical Curve	151	193	247	
Sag Vertical Curve	136	157	181	
Grade				
Maximum	4%[4]	3%	3%	
Minimum	0.75%[5]	0.5%	0.5%	
Vertical Clearance at Structures (Feet) - Minimum				
Highways/Streets Over Highway/Street	16'-6"	16'-6"	16'-6"	
Cover Over Highway/Street	16'-6"	16'-6"	16'-6"	
UPRR/BNSF/DRIR under Highway/Street	23'-4"	23'-4"	23'-4"	
UPRR/BNSF over Highway/Street[1]	16'-6"	16'-6"	16'-6"	
UPRR/BNSF over Highway/Street[2]	17'-6"	17'-6"	17'-6"	
UPRR/BNSF over Highway/Street[3]	20'-0"	20'-0"	20'-0"	
Overhead Wires	21'-6"	21'-6"	21'-6"	
Pedestrian/Utilities/Sign Structures over Highway/Street	17'-6"	17'-6"	17'-6"	
Bridge Structure over Sidewalk	10'-0"	10'-0"	10'-0"	
Tolled Express Lanes (Feet)				
Buffer Width	4	4	4	
Ingress/Egress Lengths	2,000	2,000	2,000	
Weave Distance per Lane at all Ingress/Egress Locations	800	800	800	

1 - Steel superstructure with 5 or more beams or 4 or more deck plate girders per track
2 - Concrete superstructure or steel through plate girder with bolted bottom flanges
3 - Steel through plate girders without bolted bottom flanges
4 - 4% maximum grade allowed between Brighton Boulevard to UPRR Bridge only, 3% maximum grade allowed east of UPRR Bridge.
5 - 0.75% minimum grade required within the Lowered Section only, 0.5% minimum grade required east of Colorado Boulevard
6 - 8 foot full depth shoulder with a 4 foot capped hard surface as per Design Exception 6 in Table 9-1 and shown in the Roadway Typical Sections in Schedule 10B from Sand Creek to east of Peoria Street, and an 8 foot full depth shoulder as shown in Roadway Typical Sections in Schedule 10B from east of Peoria Street to I-225.
7 - Shoulder widths shall be as listed in this Appendix A unless otherwise permitted by the Approved Design Exceptions as shown in Table 9-1

Brighton Boulevard Ramps					
Design Element	**Brighton Boulevard Westbound Entrance Ramp**	**Brighton Boulevard Eastbound Exit Ramp**	**Brighton Boulevard Westbound Exit Ramp**	**Brighton Boulevard Eastbound Entrance Ramp**	**Remarks**
Standards Applied	CDOT/FHWA				
General					
Roadway Classification	Ramp	Ramp	Ramp	Ramp	
Design Speed (MPH) (Ramp Proper)	45	45	45	45	
Design Vehicle	WB-67	WB-67	WB-67	WB-67	
EN-EX Ramp Spacing on Mainline (Weave)	1,000	950	1,600	1,600	
Horizontal Alignment Criteria					
Curve Radius (Feet) - Minimum	643	643	643	643	
Stopping Sight Distance at Design Speed (Feet) - At level grade	360	360	360	360	
Cross Slope	2%	2%	2%	2%	
Superelevation (e max)	6%	6%	6%	6%	
Clear Zone (Feet)					
Minimum	20	20	20	20	
Desirable	22	22	22	22	
Number of Lanes	1	1	1	2	
Lane Widths (Feet)	12+12	15	15	12+12	
Shoulder Widths (Feet)					
Inside	4	4	4	4	
Outside	8	6	6	8	
Side Slopes					
Cut Slope	Equal to or Flatter than 3:1	Equal to or Flatter than 3:1	Equal to or Flatter than 3:1	Equal to or Flatter than 3:1	
Fill Slope	Equal to or Flatter than 4:1 (H<15)	Equal to or Flatter than 4:1 (H<15)	Equal to or Flatter than 4:1 (H<15)	Equal to or Flatter than 4:1 (H<15)	
Z-slope Dist (6:1 Slope) (Feet)	12	12	12	12	

Brighton Boulevard Ramps					
Design Element	**Brighton Boulevard Westbound Entrance Ramp**	**Brighton Boulevard Eastbound Exit Ramp**	**Brighton Boulevard Westbound Exit Ramp**	**Brighton Boulevard Eastbound Entrance Ramp**	**Remarks**
Vertical Alignment Criteria					
K-Values					
Crest Vertical Curve	61	61	61	61	
Sag Vertical Curve	79	79	79	79	
Grade					
Maximum	5%	6%	4%	4%	
Minimum	0.5%	0.5%	0.5%	0.5%	
Vertical Clearance at Structures - Minimum					
Highways/Streets Over Highway/Street	16'-6"	16'-6"	16'-6"	16'-6"	
UPRR/BNSF under Highway/Street	23'-4"	23'-4"	23'-4"	23'-4"	
UPRR/BNSF over Highway/Street[1]	16'-6"	16'-6"	16'-6"	16'-6"	
UPRR/BNSF over Highway/Street[2]	17'-6"	17'-6"	17'-6"	17'-6"	
UPRR/BNSF over Highway/Street[3]	20'-0"	20'-0"	20'-0"	20'-0"	
Overhead Wires	21'-6"	21'-6"	21'-6"	21'-6"	
Pedestrian/Utilities/Sign Structures over Highway/Street	17'-6"	17'-6"	17'-6"	17'-6"	
Bridge Structure over Sidewalk	10'-0"	10'-0"	10'-0"	10'-0"	

1 - Steel superstructure with 5 or more beams or 4 or more deck plate girders per track
2 - Concrete superstructure or steel through plate girder with bolted bottom flanges
3 - Steel through plate girders without bolted bottom flanges

Vasquez Boulevard/Steele Street Ramps			
Design Element	**Vasquez Boulevard Westbound Entrance Ramps**	**Steele Street Eastbound Exit Ramp**	**Remarks**
Standards Applied	CDOT/FHWA		
General			
Roadway Classification	Ramp	Ramp	
Design Speed (MPH) (Ramp Proper)	45	45	
Design Vehicle	WB-67	WB-67	
EN-EX Ramp Spacing on Mainline (Weave)	1,600	1,600	
Horizontal Alignment Criteria			
Curve Radius (Feet) - Minimum	643	643	
Stopping Sight Distance at Design Speed (Feet) - At level grade	360	360	
Cross Slope	2%	2%	
Superelevation (e max)	6%	6%	
Clear Zone (Feet)			
Minimum	20	20	
Desirable	22	22	
Number of Lanes	1	1	
Lane Widths (Feet)	12+12	15	
Shoulder Widths (Feet)			
Inside	4	4	
Outside	8	6	
Side Slopes			
Cut Slope	Equal to or Flatter than 3:1	Equal to or Flatter than 3:1	
Fill Slope	Equal to or Flatter than 4:1 (H<15)	Equal to or Flatter than 4:1 (H<15)	
Z-slope Dist (6:1 Slope) (Feet)	12	12	
Vertical Alignment Criteria			
K-Values			
Crest Vertical Curve	61	61	
Sag Vertical Curve	79	79	

Vasquez Boulevard/Steele Street Ramps			
Design Element	**Vasquez Boulevard Westbound Entrance Ramps**	**Steele Street Eastbound Exit Ramp**	**Remarks**
Grade			
Maximum	5%	5%	
Minimum	0.5%	0.5%	
Vertical Clearance at Structures - Minimum			
Highways/Streets Over Highway/Street	16'-6"	16'-6"	
UPRR/BNSF under Highway/Street	23'-4"	23'-4"	
UPRR/BNSF over Highway/Street[1]	16'-6"	16'-6"	
UPRR/BNSF over Highway/Street[2]	17'-6"	17'-6"	
UPRR/BNSF over Highway/Street[3]	20'-0"	20'-0"	
Overhead Wires	21'-6"	21'-6"	
Pedestrian/Utilities/Sign Structures over Highway/Street	17'-6"	17'-6"	
Bridge Structure over Sidewalk	10'-0"	10'-0"	

1 - Steel superstructure with 5 or more beams or 4 or more deck plate girders per track
2 - Concrete superstructure or steel through plate girder with bolted bottom flanges
3 - Steel through plate girders without bolted bottom flanges

Colorado Boulevard Ramps					
Design Element	**Colorado Boulevard Westbound Entrance Slip Ramp**	**Colorado Boulevard Eastbound Exit Ramp**	**Colorado Boulevard Westbound Exit Ramp**	**Colorado Boulevard Eastbound Entrance Ramp**	**Remarks**
Standards Applied	CDOT/FHWA				
General					
Roadway Classification	Ramp	Ramp	Ramp	Ramp	
Design Speed (MPH) (Ramp Proper)	45	45	45	45	
Design Vehicle	WB-67	WB-67	WB-67	WB-67	
EN-EN and EN-EX Ramp Spacing on Mainline (Weave)	1,000	1,600	1,600	1,600	
Horizontal Alignment Criteria					
Curve Radius (Feet) - Minimum	643	643	643	643	
Stopping Sight Distance at Design Speed (Feet) - At level grade	360	360	360	360	
Cross Slope	2%	2%	2%	2%	
Superelevation (e max)	6%	6%	6%	6%	
Clear Zone (Feet)					
Minimum	20	20	20	20	
Desirable	22	22	22	22	
Number of Lanes	1	1	1	2	
Lane Widths (Feet)	12+12	15	15	12+12	
Shoulder Widths (Feet)					
Inside	4	4	4	4	
Outside	8	6	6	6	
Side Slopes					
Cut Slope	Equal to or Flatter than 3:1	Equal to or Flatter than 3:1	Equal to or Flatter than 3:1	Equal to or Flatter than 3:1	
Fill Slope	Equal to or Flatter than 4:1 (H<15)	Equal to or Flatter than 4:1 (H<15)	Equal to or Flatter than 4:1 (H<15)	Equal to or Flatter than 4:1 (H<15)	
Z-slope Dist (6:1 Slope) (Feet)	12	12	12	12	

Colorado Boulevard Ramps					
Design Element	**Colorado Boulevard Westbound Entrance Slip Ramp**	**Colorado Boulevard Eastbound Exit Ramp**	**Colorado Boulevard Westbound Exit Ramp**	**Colorado Boulevard Eastbound Entrance Ramp**	**Remarks**
Vertical Alignment Criteria					
K-Values					
Crest Vertical Curve	61	61	61	61	
Sag Vertical Curve	79	79	79	79	
Grade					
Maximum	6%	6%	4%	4%	
Minimum	0.5%	0.5%	0.5%	0.5%	
Vertical Clearance at Structures - Minimum					
Highways/Streets Over Highway/Street	16'-6"	16'-6"	16'-6"	16'-6"	
UPRR/BNSF under Highway/Street	23'-4"	23'-4"	23'-4"	23'-4"	
UPRR/BNSF over Highway/Street[1]	16'-6"	16'-6"	16'-6"	16'-6"	
UPRR/BNSF over Highway/Street[2]	17'-6"	17'-6"	17'-6"	17'-6"	
UPRR/BNSF over Highway/Street[3]	20'-0"	20'-0"	20'-0"	20'-0"	
Overhead Wires	21'-6"	21'-6"	21'-6"	21'-6"	
Pedestrian/Utilities/Sign Structures over Highway/Street	17'-6"	17'-6"	17'-6"	17'-6"	
Bridge Structure over Sidewalk	10'-0"	10'-0"	10'-0"	10'-0"	

1 - Steel superstructure with 5 or more beams or 4 or more deck plate girders per track
2 - Concrete superstructure or steel through plate girder with bolted bottom flanges
3 - Steel through plate girders without bolted bottom flanges

Holly Street Ramps					
Design Element	**Holly Street Westbound Entrance Ramp**	**Holly Street Eastbound Exit Ramp**	**Holly Street Westbound Exit Ramp**	**Holly Street Eastbound Entrance Ramp**	**Remarks**
Standards Applied	CDOT/FHWA				
General					
Roadway Classification	Ramp	Ramp	Ramp	Ramp	
Design Speed (MPH) (Ramp Proper)	45	45	45	45	
Design Vehicle	WB-67	WB-67	WB-67	WB-67	
EN-EX Ramp Spacing on Mainline (Weave)	1,600	1,600	1,600	1,600	
Horizontal Alignment Criteria					
Curve Radius (Feet) - Minimum	643	643	643	643	
Stopping Sight Distance at Design Speed (Feet) - At level grade	360	360	360	360	
Cross Slope	2%	2%	2%	2%	
Superelevation (e max)	6%	6%	6%	6%	
Clear Zone (Feet)					
Minimum	20	20	20	20	
Desirable	22	22	22	22	
Number of Lanes	2	1	1	2	
Lane Widths (Feet)	12+12	15	15	12+12	
Shoulder Widths (Feet)					
Inside	4	4	4	4	
Outside	8	6	6	8	
Side Slopes					
Cut Slope	Equal to or Flatter than 3:1	Equal to or Flatter than 3:1	Equal to or Flatter than 3:1	Equal to or Flatter than 3:1	
Fill Slope	Equal to or Flatter than 4:1 (H<15)	Equal to or Flatter than 4:1 (H<15)	Equal to or Flatter than 4:1 (H<15)	Equal to or Flatter than 4:1 (H<15)	
Z-slope Dist (6:1 Slope) (Feet)	12	12	12	12	

Holly Street Ramps					
Design Element	**Holly Street Westbound Entrance Ramp**	**Holly Street Eastbound Exit Ramp**	**Holly Street Westbound Exit Ramp**	**Holly Street Eastbound Entrance Ramp**	**Remarks**
Vertical Alignment Criteria					
K-Values					
Crest Vertical Curve	61	61	61	61	
Sag Vertical Curve	79	79	79	79	
Grade					
Maximum	4%	4%	4%	4%	
Minimum	0.5%	0.5%	0.5%	0.5%	
Vertical Clearance at Structures - Minimum					
Highways/Streets Over Highway/Street	16'-6"	16'-6"	16'-6"	16'-6"	
UPRR/BNSF under Highway/Street	23'-4"	23'-4"	23'-4"	23'-4"	
UPRR/BNSF over Highway/Street[1]	16'-6"	16'-6"	16'-6"	16'-6"	
UPRR/BNSF over Highway/Street[2]	17'-6"	17'-6"	17'-6"	17'-6"	
UPRR/BNSF over Highway/Street[3]	20'-0"	20'-0"	20'-0"	20'-0"	
Overhead Wires	21'-6"	21'-6"	21'-6"	21'-6"	
Pedestrian/Utilities/Sign Structures over Highway/Street	17'-6"	17'-6"	17'-6"	17'-6"	
Bridge Structure over Sidewalk	10'-0"	10'-0"	10'-0"	10'-0"	

1 - Steel superstructure with 5 or more beams or 4 or more deck plate girders per track
2 - Concrete superstructure or steel through plate girder with bolted bottom flanges
3 - Steel through plate girders without bolted bottom flanges

Quebec Street Ramps					
Design Element	**Quebec Street Westbound Entrance Ramp**	**Quebec Street Eastbound Exit Ramp**	**Quebec Street Westbound Exit Ramp**	**Quebec Street Eastbound Entrance Ramp**	**Remarks**
Standards Applied	CDOT/FHWA				
General					
Roadway Classification	Ramp	Ramp	Ramp	Ramp	
Design Speed (MPH) (Ramp Proper)	45	45	45	45	
Design Vehicle	WB-67	WB-67	WB-67	WB-67	
EN-EX Ramp Spacing on Mainline (Weave)	1,600	1,600	1,600	1,600	
Horizontal Alignment Criteria					
Curve Radius (Feet) - Minimum	643	643	643	643	
Stopping Sight Distance at Design Speed (Feet) - At level grade	360	360	360	360	
Cross Slope	2%	2%	2%	2%	
Superelevation (e max)	6%	6%	6%	6%	
Clear Zone (Feet)					
Minimum	20	20	20	20	
Desirable	22	22	22	22	
Number of Lanes	2	2	2	1	
Lane Widths (Feet)	12+12	12+12	12+12	12+12	
Shoulder Widths (Feet)					
Inside	4	4	4	4	
Outside	8	8	8	8	
Side Slopes					
Cut Slope	Equal to or Flatter than 3:1	Equal to or Flatter than 3:1	Equal to or Flatter than 3:1	Equal to or Flatter than 3:1	
Fill Slope	Equal to or Flatter than 4:1 (H<15)	Equal to or Flatter than 4:1 (H<15)	Equal to or Flatter than 4:1 (H<15)	Equal to or Flatter than 4:1 (H<15)	
Z-slope Dist (6:1 Slope) (Feet)	12	12	12	12	

Quebec Street Ramps					
Design Element	**Quebec Street Westbound Entrance Ramp**	**Quebec Street Eastbound Exit Ramp**	**Quebec Street Westbound Exit Ramp**	**Quebec Street Eastbound Entrance Ramp**	**Remarks**
Vertical Alignment Criteria					
K-Values					
Crest Vertical Curve	61	61	61	61	
Sag Vertical Curve	79	79	79	79	
Grade					
Maximum	6.0%	6.0%	6.0%	6.0%	
Minimum	0.5%	0.5%	0.5%	0.5%	
Vertical Clearance at Structures - Minimum					
Highways/Streets Over Highway/Street	16'-6"	16'-6"	16'-6"	16'-6"	
UPRR/BNSF under Highway/Street	23'-4"	23'-4"	23'-4"	23'-4"	
UPRR/BNSF over Highway/Street[1]	16'-6"	16'-6"	16'-6"	16'-6"	
UPRR/BNSF over Highway/Street[2]	17'-6"	17'-6"	17'-6"	17'-6"	
UPRR/BNSF over Highway/Street[3]	20'-0"	20'-0"	20'-0"	20'-0"	
Overhead Wires	21'-6"	21'-6"	21'-6"	21'-6"	
Pedestrian/Utilities/Sign Structures over Highway/Street	17'-6"	17'-6"	17'-6"	17'-6"	
Bridge Structure over Sidewalk	10'-0"	10'-0"	10'-0"	10'-0"	

1 - Steel superstructure with 5 or more beams or 4 or more deck plate girders per track
2 - Concrete superstructure or steel through plate girder with bolted bottom flanges
3 - Steel through plate girders without bolted bottom flanges

I-270 and Central Park Boulevard Ramps							
Design Element	**I-270 Eastbound Connector**	**Central Park Boulevard Westbound Entrance Ramp**	**Central Park Boulevard Eastbound Exit Ramp**	**I-70 Westbound To I-270 Ramp**	**Central Park Boulevard Eastbound Entrance Ramp**	**I-270 Eastbound to I-70 Eastbound Ramp**	**Remarks**
Standards Applied	CDOT/FHWA						
General							
Roadway Classification	Ramp	Ramp	Ramp	Ramp	Ramp	Ramp	
Design Speed (MPH) (Ramp Proper)	55	55	55	55	55	55	
Design Vehicle	WB-67	WB-67	WB-67	WB-67	WB-67	WB-67	
EN-EX Ramp spacing on mainline (weave)	1,600	1,600	1,600	1,000	1,600	1,000	
Horizontal Alignment Criteria							
Curve Radius (Feet) - Minimum	1,060	1,060	1,060	1,060	1,060	1,060	
Stopping Sight Distance at Design Speed (Feet) - At level grade	495	495	495	495	495	495	
Cross Slope	2%	2%	2%	2%	2%	2%	
Superelevation (e max)	6%	6%	6%	6%	6%	6%	
Clear Zone (Feet)							
Minimum	20	16	16	16	16	16	
Desirable	22	18	18	18	18	18	
Number of Lanes	2	1	1	2	1	2	
Lane Widths (Feet)	12+12	15	15	12+12	15	12+12	
Shoulder Widths (Feet)							
Inside	9[1]	4	4	4	4	4	
Outside	10	6	8	8	6	10	
Side Slopes							
Cut Slope	Equal to or Flatter than 3:1	Equal to or Flatter than 3:1	Equal to or Flatter than 3:1	Equal to or Flatter than 3:1	Equal to or Flatter than 3:1	Equal to or Flatter than 3:1	
Fill Slope	Equal to or Flatter than 4:1 (H<15)	Equal to or Flatter than 4:1 (H<15)	Equal to or Flatter than 4:1 (H<15)	Equal to or Flatter than 4:1 (H<15)	Equal to or Flatter than 4:1 (H<15)	Equal to or Flatter than 4:1 (H<15)	
Z-slope Dist (6:1 Slope) (Feet)	12	12	12	12	12	12	

I-270 and Central Park Boulevard Ramps							
Design Element	**I-270 Eastbound Connector**	**Central Park Boulevard Westbound Entrance Ramp**	**Central Park Boulevard Eastbound Exit Ramp**	**I-70 Westbound To I-270 Ramp**	**Central Park Boulevard Eastbound Entrance Ramp**	**I-270 Eastbound to I-70 Eastbound Ramp**	**Remarks**
Vertical Alignment Criteria							
K-Values							
Crest Vertical Curve	114	114	114	114	114	114	
Sag Vertical Curve	115	115	115	115	115	115	
Grade							
Maximum	4%	5%	4%	4%	4%	4%	
Minimum	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	
Vertical Clearance at Structures - Minimum							
Highways/Streets Over Highway/Street	16'-6"	16'-6"	16'-6"	16'-6"	16'-6"	16'-6"	
UPRR/BNSF under Highway/Street	23'-4"	23'-4"	23'-4"	23'-4"	23'-4"	23'-4"	
UPRR/BNSF over Highway/Street[2]	16'-6"	16'-6"	16'-6"	16'-6"	16'-6"	16'-6"	
UPRR/BNSF over Highway/Street[3]	17'-6"	17'-6"	17'-6"	17'-6"	17'-6"	17'-6"	
UPRR/BNSF over Highway/Street[4]	20'-0"	20'-0"	20'-0"	20'-0"	20'-0"	20'-0"	
Overhead Wires	21'-6"	21'-6"	21'-6"	21'-6"	21'-6"	21'-6"	
Pedestrian/Utilities/Sign Structures over Highway/Street	17'-6"	17'-6"	17'-6"	17'-6"	17'-6"	17'-6"	
Bridge Structure over Sidewalk	10'-0"	10'-0"	10'-0"	10'-0"	10'-0"	10'-0"	

1 – Subject to satisfaction of the ATC Conditions applicable to the "ATC 28.1 Modifications" (as both such terms are defined in Part B of Schedule 28 (*Proposal Extracts*)), 4 feet.
2 - Steel superstructure with 5 or more beams or 4 or more deck plate girders per track
3 - Concrete superstructure or steel through plate girder with bolted bottom flanges
4 - Steel through plate girders without bolted bottom flanges

Peoria Street and I-225 Ramps					
Design Element	**Peoria Street Westbound Entrance Ramp**	**Peoria Street Eastbound Exit Ramp**	**Peoria Street Eastbound Entrance Ramp**	**I-70 EB to I-225 Southbound GP Connector Ramp**	**Remarks**
Standards Applied	CDOT/FHWA				
General					
Roadway Classification	Ramp	Ramp	Ramp	Ramp	
Design Speed (MPH) (Ramp Proper)	45	45	45	55	
Design Vehicle	WB-67	WB-67	WB-67	WB-67	
EN-EX Ramp spacing on mainline (weave)	1,600	1,600	1,600	1,600	
Horizontal Alignment Criteria					
Curve Radius (Feet) - Minimum	643	643	643	1,060	
Stopping Sight Distance at Design Speed (Feet) - At level grade	360	360	360	495	
Cross Slope	2%	2%	2%	2%	
Superelevation (e max)	6%	6%	6%	6%	
Clear Zone (Feet)					
Minimum	16	16	16	16	
Desirable	18	18	18	18	
Number of Lanes	2	2	2	3	
Lane Widths (Feet)	12+12	12+12	12+12	12+12+12	
Shoulder Widths (Feet)					
Inside	4	4	4	4	
Outside	8	8	8	8	
Side Slopes					
Cut Slope	Equal to or Flatter than 3:1	Equal to or Flatter than 3:1	Equal to or Flatter than 3:1	Equal to or Flatter than 3:1	
Fill Slope	Equal to or Flatter than 4:1 (H<15)	Equal to or Flatter than 4:1 (H<15)	Equal to or Flatter than 4:1 (H<15)	Equal to or Flatter than 4:1 (H<15)	
Z-slope Dist (6:1 Slope) (Feet)	12	12	12	12	

Peoria Street and I-225 Ramps					
Design Element	**Peoria Street Westbound Entrance Ramp**	**Peoria Street Eastbound Exit Ramp**	**Peoria Street Eastbound Entrance Ramp**	**I-70 EB to I-225 Southbound GP Connector Ramp**	**Remarks**
Vertical Alignment Criteria					
K-Values					
Crest Vertical Curve	61	61	61	114	
Sag Vertical Curve	79	79	79	115	
Grade					
Maximum	4%	4%	5%	4%	
Minimum	0.5%	0.5%	0.5%	0.5%	
Vertical Clearance at Structures - Minimum					
Highways/Streets Over Highway/Street	16'-6"	16'-6"	16'-6"	16'-6"	
UPRR/BNSF under Highway/Street	23'-4"	23'-4"	23'-4"	23'-4"	
UPRR/BNSF over Highway/Street[1]	16'-6"	16'-6"	16'-6"	16'-6"	
UPRR/BNSF over Highway/Street[2]	17'-6"	17'-6"	17'-6"	17'-6"	
UPRR/BNSF over Highway/Street[3]	20'-0"	20'-0"	20'-0"	20'-0"	
Overhead Wires	21'-6"	21'-6"	21'-6"	21'-6"	
Pedestrian/Utilities/Sign Structures over Highway/Street	17'-6"	17'-6"	17'-6"	17'-6"	
Bridge Structure over Sidewalk	10'-0"	10'-0"	10'-0"	10'-0"	

1 - Steel superstructure with 5 or more beams or 4 or more deck plate girders per track
2 - Concrete superstructure or steel through plate girder with bolted bottom flanges
3 - Steel through plate girders without bolted bottom flanges

Cross Streets: Brighton Boulevard to Clayton Street						
Design Element	**Brighton Boulevard**	**York Street**	**Josephine Street**	**Columbine Street**	**Clayton Street**	**Remarks**
Standards Applied	Denver	Denver	Denver	Denver	Denver	
General						
Roadway Classification	4-lane Principal Arterial	2-lane Minor Arterial	2-lane Minor Arterial	2-lane Local	2-lane Collector	
Posted Speed Limit (MPH)	35	30	30	25	25	
Design Speed (MPH)	35	35	35	25	30	
Design Vehicle	WB-67[7]	WB-67	SU-30	SU-30	SU-30	
Horizontal Alignment Criteria						
Curve Radius (Feet) - Minimum	510[8]	510	510	198	333	
Stopping Sight Distance at Design Speed (Feet) - At level grade	250	250	250	155	200	
Cross Slope	2%	2%[9]	2%[9]	2%[10]	2%[10]	
Superelevation (e max)	NC	NC	NC	NC	NC	
Clear Zone (Feet)						
Minimum	N/A	N/A	N/A	N/A	N/A	
Desirable	N/A	N/A	N/A	N/A	N/A	
Minimum Lane Widths (Feet) – to edge of pan[4, 5]	11	12	12	14	18	
Vertical Alignment Criteria						
K-Values						
Crest Vertical Curve	29	29	29	12	19	
Sag Vertical Curve	49	49	49	26	37	
Grade						
Maximum	6%	6%	6%	6%	6%	
Minimum[6]	0.7%	0.7%	0.7%	0.7%	0.7%	
Vertical Clearance at Structures - Minimum						
Highways/Streets Over Highway/Street	16'-6"	16'-6"	16'-6"	16'-6"	16'-6"	
UPRR/BNSF under Highway/Street	23'-4"	23'-4"	23'-4"	23'-4"	23'-4"	
UPRR/BNSF over Highway/Street[1]	16'-6"	16'-6"	16'-6"	16'-6"	16'-6"	
UPRR/BNSF over Highway/Street[2]	17'-6"	17'-6"	17'-6"	17'-6"	17'-6"	
UPRR/BNSF over Highway/Street[3]	20'-0"	20'-0"	20'-0"	20'-0"	20'-0"	
Overhead Wires	21'-6"	21'-6"	21'-6"	21'-6"	21'-6"	

Cross Streets: Brighton Boulevard to Clayton Street						
Design Element	**Brighton Boulevard**	**York Street**	**Josephine Street**	**Columbine Street**	**Clayton Street**	**Remarks**
Pedestrian/Utilities/Sign Structures over Highway/Street	17'-6"	17'-6"	17'-6"	17'-6"	17'-6"	
Bridge Structure over Sidewalk	10'-0"	10'-0"	10'-0"	10'-0"	10'-0"	

1 - Steel superstructure with 5 or more beams or 4 or more deck plate girders per track
2 - Concrete superstructure or steel through plate girder with bolted bottom flanges
3 - Steel through plate girders without bolted bottom flanges
4 - Lane widths on bridge structures shall be in accordance with the Structure Typical Sections provided in Schedule 10B Contract Drawings
5 - Provide for on-street parking per CCD Standard 5.1
6 - Local Agency Roadways shall provide a minimum grade of 0.7%, though flatter grades of no less than 0.5% may be approved at the discretion of the Public Works Engineering, Regulatory & Analytics Office within CCD
7 - The design vehicle for the intersection of Brighton Boulevard and 47th Avenue shall be a SU-30
8 - The existing horizontal curve, between the UPRR Pepsi Lead tracks and southern ramp terminal, may match existing conditions
9 – Subject to satisfaction of the ATC Conditions applicable to the "ATC 18.1 Modifications" (as both such terms are defined in Part B of Schedule 28 (*Proposal Extracts*)), 1% normal crown cross slope between 46th South and 46th North
10 – Subject to satisfaction of the ATC Conditions applicable to the "ATC 18.1 Modifications" (as both such terms are defined in Part B of Schedule 28 (*Proposal Extracts*)), 2% reverse crown cross slope between 46th South and 46th North

Cross Streets: Fillmore Street to Colorado Boulevard						
Design Element	**Fillmore Street**	**Steele Street/ Vasquez Boulevard**	**Cook Street**	**Monroe Street**	**Colorado Boulevard**	**Remarks**
Standards Applied	Denver	CDOT/FHWA	Denver	Denver	CDOT/FHWA	
General						
Roadway Classification	2-lane Local	4-lane Minor Arterial	2-lane Collector	2-lane Collector	6-lane Principal Arterial	
Posted Speed Limit (MPH)	25	35	25	25	40	
Design Speed (MPH)	25	35	25	25	45	
Design Vehicle	SU-30	WB-67[7]	WB-67	WB-67	WB-67	
Horizontal Alignment Criteria						
Curve Radius (Feet) - Minimum	198	510	198	198	1,039	
Stopping Sight Distance at Design Speed (Feet) - At level grade	155	250	155	155	360	
Cross Slope	2%[10]	2%[8]	2%[8]	2%[10]	2%[9]	
Superelevation (e max)	NC	NC	NC	NC	NC	
Clear Zone (Feet)						
Minimum	N/A	N/A	N/A	N/A	20	
Desirable	N/A	N/A	N/A	N/A	22	
Minimum Lane Widths (Feet) – to edge of pan[4, 5]	14	12	18	18	12	
Vertical Alignment Criteria						
K-Values						
Crest Vertical Curve	12	29	12	12	61	
Sag Vertical Curve	26	49	26	26	79	
Grade						
Maximum	6%	6%	6%	6%	6%	
Minimum[6]	0.7%	0.5%	0.7%	0.7%	0.5%	
Vertical Clearance at Structures - Minimum						
Highways/Streets Over Highway/Street	16'-6"	16'-6"	16'-6"	16'-6"	16'-6"	
UPRR/BNSF under Highway/Street	23'-4"	23'-4"	23'-4"	23'-4"	23'-4"	
UPRR/BNSF over Highway/Street[1]	16'-6"	16'-6"	16'-6"	16'-6"	16'-6"	

Cross Streets: Fillmore Street to Colorado Boulevard						
Design Element	**Fillmore Street**	**Steele Street/ Vasquez Boulevard**	**Cook Street**	**Monroe Street**	**Colorado Boulevard**	**Remarks**
UPRR/BNSF over Highway/Street[2]	17'-6"	17'-6"	17'-6"	17'-6"	17'-6"	
UPRR/BNSF over Highway/Street[3]	20'-0"	20'-0"	20'-0"	20'-0"	20'-0"	
Overhead Wires	21'-6"	21'-6"	21'-6"	21'-6"	21'-6"	
Pedestrian/Utilities/Sign Structures over Highway/Street	17'-6"	17'-6"	17'-6"	17'-6"	17'-6"	
Bridge Structure over Sidewalk	10'-0"	10'-0"	10'-0"	10'-0"	10'-0"	

1 - Steel superstructure with 5 or more beams or 4 or more deck plate girders per track
2 - Concrete superstructure or steel through plate girder with bolted bottom flanges
3 - Steel through plate girders without bolted bottom flanges
4 - Lane widths on bridge structures shall be in accordance with the Structure Typical Sections provided in Schedule 10B Contract Drawings
5 - Provide for on-street parking per CCD Standard 5.1
6 - Local Agency Roadways shall provide a minimum grade of 0.7%, though flatter grades of no less than 0.5% may be approved at the discretion of the Public Works Engineering, Regulatory & Analytics Office within CCD
7 - The design vehicle for the intersection of Vasquez Boulevard and 47th Avenue and of Steele Street and 45th Avenue shall be a SU-30
8 – Subject to satisfaction of the ATC Conditions applicable to the "ATC 18.1 Modifications" (as both such terms are defined in Part B of Schedule 28 (*Proposal Extracts*)), 1% normal crown cross slope between 46th South and 46th North
9 – Subject to satisfaction of the ATC Conditions applicable to the "ATC 18.1 Modifications" (as both such terms are defined in Part B of Schedule 28 (*Proposal Extracts*)), compound cross slope, 1% normal crown for left turn lanes, 2% cross slope for through lanes
10 – Subject to satisfaction of the ATC Conditions applicable to the "ATC 18.1 Modifications" (as both such terms are defined in Part B of Schedule 28 (*Proposal Extracts*)), 2% reverse crown cross slope between 46th South and 46th North

Cross Streets: Dahlia Street to Peoria Street						
Design Element	**Dahlia Street**	**Holly Street**	**Monaco Street**	**Quebec Street**	**Peoria Street**	**Remarks**
Standards Applied	Denver	Denver	Denver	CDOT/FHWA	Denver	
General						
Roadway Classification	2-lane Collector	2-lane Arterial	2-lane Arterial	4-lane Principal Arterial	4-lane Principal Arterial	
Posted Speed Limit (MPH)	30	30	30	40	35	
Design Speed (MPH)	35	35	35	45	40	
Design Vehicle	WB-67	WB-67	WB-67	WB-67	WB-67	
Horizontal Alignment Criteria						
Curve Radius (Feet) - Minimum	510	510	510	1,039	762	
Stopping Sight Distance at Design Speed (Feet) - At level grade	250	250	250	360	305	
Cross Slope	2%	2%	2%	2%	2%	
Superelevation (e max)	NC	NC	NC	NC	NC	
Clear Zone (Feet)						
Minimum	N/A	N/A	N/A	20	N/A	
Desirable	N/A	N/A	N/A	22	N/A	
Minimum Lane Widths (Feet) – to edge of pan[4, 5]	12	12	12	12	12	
Vertical Alignment Criteria						
K-Values						
Crest Vertical Curve	29	29	29	61	44	
Sag Vertical Curve	49	49	49	79	64	
Grade						
Maximum	6%	6%	6%	6%	6%	
Minimum[6]	0.7%	0.7%	0.7%	0.5%	0.7%	
Vertical Clearance at Structures - Minimum						
Highways/Streets Over Highway/Street	16'-6"	16'-6"	16'-6"	16'-6"	16'-6"	
UPRR/BNSF under Highway/Street	23'-4"	23'-4"	23'-4"	23'-4"	23'-4"	
UPRR/BNSF over Highway/Street[1]	16'-6"	16'-6"	16'-6"	16'-6"	16'-6"	
UPRR/BNSF over Highway/Street[2]	17'-6"	17'-6"	17'-6"	17'-6"	17'-6"	
UPRR/BNSF over Highway/Street[3]	20'-0"	20'-0"	20'-0"	20'-0"	20'-0"	
Overhead Wires	21'-6"	21'-6"	21'-6"	21'-6"	21'-6"	

Cross Streets: Dahlia Street to Peoria Street						
Design Element	**Dahlia Street**	**Holly Street**	**Monaco Street**	**Quebec Street**	**Peoria Street**	**Remarks**
Pedestrian/Utilities/Sign Structures over Highway/Street	17'-6"	17'-6"	17'-6"	17'-6"	17'-6"	
Bridge Structure over Sidewalk	10'-0"	10'-0"	10'-0"	10'-0"	10'-0"	

1 - Steel superstructure with 5 or more beams or 4 or more deck plate girders per track
2 - Concrete superstructure or steel through plate girder with bolted bottom flanges
3 - Steel through plate girders without bolted bottom flanges
4 - Lane widths on bridge structures shall be in accordance with the Structure Typical Sections provided in Schedule 10B Contract Drawings
5 - Provide for on-street parking per CCD Standard 5.1
6 - Local Agency Roadways shall provide a minimum grade of 0.7%, though flatter grades of no less than 0.5% may be approved at the discretion of the Public Works Engineering, Regulatory & Analytics Office within CCD

Design Element	46th Avenue Brighton Blvd to York Street	46th Avenue York Street to Steele Street	46th Avenue/Stapleton Drive Steele Street to Quebec Street	Local Road	UPRR Sidewalk	Remarks
Standards Applied	Denver	Denver	Denver	Denver	Denver	
General						
Roadway Classification	Collector	Local	Collector	Access	Sidewalk	
Posted Speed Limit (MPH)	35	30	35	25	N/A	
Design Speed (MPH)	35	30	35	25	N/A	
Design Vehicle[8]	WB-67	WB-67	WB-67	Local Agency Standards	N/A	
Horizontal Alignment Criteria						
Curve Radius (Feet) - Minimum	510	333	510	198	N/A	
Stopping Sight Distance at Design Speed (Feet) - At level grade	250	200	250	155	N/A	
Cross Slope	2%	2%	2%	2%	2%	
Superelevation (e max)	NC	NC	NC	NC	N/A	
Number of Thru Lanes	2	2	2	2	N/A	
Minimum Lane Widths (Feet) – to edge of pan[4, 5]	12	12[6]	12[9]	10, 18[10]	N/A	
Vertical Alignment Criteria						
K-Values						
Crest Vertical Curve	29	19	29	12	N/A	
Sag Vertical Curve	49	37	49	26	N/A	
Grade						
Maximum	6%	3%[11]	3%[11]	6%	ADA	
Minimum[7]	0.7%	0.7%	0.7%	0.7%	ADA	
Maximum at railroad crossings	0.1%	0.1%	0.1%	0.1%	N/A	
Vertical Clearance at Structures - Minimum						
Highways/Streets Over Highway/Street	16'-6"	16'-6"	16'-6"	16.5	16.5	
UPRR/BNSF under Highway/Street	23'-4"	23'-4"	23'-4"	23'-4"	23'-4"	
UPRR/BNSF over Highway/Street[1]	16'-6"	16'-6"	16'-6"	16.5	16.5	

Design Element	46th Avenue Brighton Blvd to York Street	46th Avenue York Street to Steele Street	46th Avenue/Stapleton Drive Steele Street to Quebec Street	Local Road	UPRR Sidewalk	Remarks
UPRR/BNSF over Highway/Street[2]	17'-6"	17'-6"	17'-6"	17.5	17.5	
UPRR/BNSF over Highway/Street[3]	20'-0"	20'-0"	20'-0"	20.0	20.0	
Overhead Wires	21'-6"	21'-6"	21'-6"	21.5	21.5	
Pedestrian/Utilities/Sign Structures over Highway/Street	17'-6"	17'-6"	17'-6"	17.5	17.5	
Bridge Structure over Sidewalk	10'-0"	10'-0"	10'-0"	10.0	10.0	

1 - Steel superstructure with 5 or more beams or 4 or more deck plate girders per track
2 - Concrete superstructure or steel through plate girder with bolted bottom flanges
3 - Steel through plate girders without bolted bottom flanges
4 - Lane widths on bridge structures shall be in accordance with the Structure Typical Sections provided in Schedule 10B Contract Drawings
5 - Provide for on-street parking per CCD Standard 5.1
6 - Provide minimum street width and lane widths in accordance with the Roadway Typical Sections provided in Schedule 10B Contract Drawings. Striping plans shall be approved by the CCD.
7 - Local Agency Roadways shall provide a minimum grade of 0.7%, though flatter grades of no less than 0.5% may be approved at the discretion of the Public Works Engineering, Regulatory & Analytics Office within CCD
8 - Cross streets control turning movements at intersection with 46th Avenue and Stapleton Drive, use 46th Avenue and Stapleton Drive design vehicle for thru traffic
9 - Lane widths on Stapleton Drive South, between Colorado Boulevard and Dahlia Street, shall be in accordance with the Roadway Typical Sections provided in Schedule 10B Contract Drawings. Striping plans shall be approved by the CCD.
10 - 10' lane width for the Local Road north of 46th Avenue North, between Brighton Boulevard and York Street and an 18' lane width on the Local Road north of Stapleton Drive North, between Colorado Boulevard and Dahlia Street. All Local Roads shall meet Local Agency standards. All Local Agency Roadways shall meet the minimum width required for emergency vehicles.
11 - Maximum profile grades of 6% will be permitted for 46th Avenue and Stapleton Drive in order to tie into ramps only

Appendix B
Denver Planned Projects

Funded

Martin Luther King Roadway (Havana to Peoria)

Central Park Boulevard (40th Avenue to 56th Avenue)

Brighton Blvd. 29th to 44th

33rd Street Outfall
Festival Street (between 33rd and 35th) & 33rd Streets (between Brighton and the river)
40th Avenue Widening (Central Park to Havana)
Central Park Boulevard (56th Avenue north to City Limits)
Central Park Boulevard Widening (36th Avenue to I-70)
National Western Center Master Plan Improvements
Westerly Creek North
Platte to Park Hill Stormwater Solutions – City Park, 39th Avenue Greenway/Channel, and Globeville Landing Outfall
Brighton Boulevard (47th to Race Court/City Limits)

Unfunded 2015-2020

Globeville-Elyria Swansea Rec Center Improvements

40th and Colorado Boulevard Multimodal Connections

40th Avenue Reconstruction – York Street to Colorado Boulevard

Safety Training Facility (near 31st & the river)

Public Works Solid Waste Facility (NE Denver - location unknown)

Police District Station 5 Replacement (at current location at 46th & Peoria or elsewhere in NE Denver)

Swansea Rec Center Enhancements

Parks Maintenance Facility (Smith & Havana)

56th Avenue Reconstruction, Havana to Pena

Washington Street - 47th to 52nd Reconstruction

35th Street from Arkins to Wazee

Quebec Reconstruction (35th to 53rd Place)/Pedestrian and Trails Connectivity

35th Street Ped Bridge over Platte River

38th & Blake Station Signalization and Multi-Modal Improvements

Globeville Elyria-Swansea Pedestrian Connectivity Improvements

47th & York Ped Bridge

RiNo Ped Bridge (S. Platte River)

Swansea Neighborhood Park Improvements (52nd & Steele)

Elyria Park Improvements

Heron Pond/Northside Park/52nd & Emerson Infrastructure
Ongoing Local Roadway Improvements and Development north of I-70 in Stapleton, from I-70 to City Limits

Havana Street from Smith Road to Florence

Sand Creek Channel and Park Improvements (Stapleton)

Smith Road Construction From Sand Creek to Havana (Stapleton)

Urban Greenway Corridor North (River North) Trail Improvements

Urban Waterways project (in partnership with the Army Corps)

38th Street RR Underpass Replacement and Connections

38th Street and Walnut Street Intersection Reconstruction/Bike-Ped Connectivity

Pena Boulevard Capacity Improvements (I-70 to 56th Avenue)

Green Valley Ranch (GVR)/Aerotropolis Improvements (Tower Road, GVR Boulevard, 56th Avenue)
New Northfield (Stapleton) Fire Station at 51st & Beeler
48th Avenue sidewalks, Brighton to York
Peoria Street Pedestrian and Trails Connectivity (37th Avenue to 56th Avenue)

Unfunded 2020-2026

County Jail Improvements (Havana & Smith Road)

Brighton Blvd./Race Street BNSF Underpass

Brighton Blvd./York BNSF Underpass

48th & Holly Roadway Expansion

47th & York Long-Term Improvement

40th & Colorado Station Area Connectivity

Brighton Boulevard - Northern Section and RR Bridge at Race Court

31st Street Bike-Ped Bridge

Platte River Enhancements (Confluence Park to I-70)

Platte River Enhancements (I-70 to City Limits)

River Promenade (River North) 29th to 38th

Pena Boulevard Capacity Improvements (I-70 to E-470)

10. RAILROADS

10.1. General

10.1.1. This Section sets out the roles and responsibilities of the Developer, the Department, and the Railroads with respect to the requirements applicable to Construction Work performed on, over, under and/or adjacent to Railroad right-of-way, including track, ballast, bridges and signals required for the Project.

10.1.2. UPRR Crossing

a. Existing conditions have the I-70 Mainline passing over the UPRR on a viaduct bridge built in the early 1960s, while 46th Avenue passes under the UPRR via a grade separation bridge built in 1939. The Department and UPRR are working independently to expand the tracks within the 36th yard. UPRR requires the completion of the yard expansion prior to moving to phase 1 of the 100% UPRR Trackwork Plans and Specifications. The Developer shall coordinate with UPRR on the status of the yard expansion work and shall include the UPRR schedule for such work in the development of its initial Baseline Schedule and in any Revised Baseline Schedule. The UPRR 36th Yard Expansion plans are included in the Reference Documents. The 100% UPRR Trackwork Plans and Specifications depict the expansion of the 36th yard tracks as existing. The Construction Work includes removal of existing bridges, bridge construction, trackwork, Railroad signalization, I-70 Mainline and appurtenances construction, and Utility Work;

b. The UPRR RRA reflects UPRR approval of:

i. 100% temporary and permanent trackwork design and construction phasing for the UPRR Crossing (100% UPRR Trackwork Plans and Specifications) which, subject to Section 1(d) of Part B of Schedule 28 (*Proposal Extracts*), the Developer shall not be permitted to amend;

ii. 30% design for the Construction Work on UPRR right-of-way including I-70 Mainline and the bridges that carry the trackwork and service road (30% UPRR Crossing Plans). The Developer shall complete the design and coordinate with UPRR to obtain approval of the 100% UPRR Crossing Plans;

c. UPRR shall be responsible to provide all Railroad flagging and Railroad signalization. UPRR trackwork responsibilities shall consist of all track shifts and associated ballast work, and all track tie-in connections, including track and ballast work, that connects existing track to new Developer constructed track, and any additional work specified in Section 10.4.9 as UPRR's responsibility;

d. The Developer shall be responsible for all other Elements of the UPRR Crossing, including but not limited to construction of I-70 Mainline and appurtenances, bridge construction, shoring, grading, drainage, lighting, all trackwork and ballast placement for track outside the 13 foot clear point as defined in the 100% UPRR Trackwork Plans and Specifications, and all related Utility Work within and outside the UPRR ROW, and any additional work specified in Section 10.4.9 as the Developer's responsibility. It shall be the Developer's responsibility to coordinate the scheduling of all separate Railroad Forces required for the performance of all Construction Work related to the UPRR Crossing;

e. Subject to Section 1(d) of Part B of Schedule 28 (*Proposal Extracts*), the Department shall pay UPRR directly for their trackwork, ballast and Railroad signalization work and the Developer shall pay for all other costs of the UPRR Work (including associated flagging costs) directly to UPRR. Cost responsibilities of the Department to UPRR are further identified in the UPRR RRA included in the Reference Documents; and

f. The UPRR approved 30% UPRR Crossing Plans are included in the Reference Documents, and the UPRR approved 100% UPRR Trackwork Plans and Specifications are included in Schedule 10B Contract Drawings.

10.1.3. UPRR Pepsi Lead Crossing

a. Existing conditions have the UPRR Pepsi Lead Crossing at-grade south of the I-70 Mainline. The Construction Work includes expansion of the existing at-grade crossing for the addition of a traffic lane and new traffic signal along Brighton Boulevard;

b. The UPRR RRA reflects UPRR approval of 30% design for the Construction Work on UPRR right-of-way including the at-grade crossing modification (30% UPRR Pepsi Lead Crossing Plans). The Developer shall complete the roadway design and coordinate with UPRR to obtain approval of the 100% UPRR Pepsi Lead Crossing Plans;

c. UPRR shall be responsible for providing all Railroad flagging, at-grade crossing modification, and Railroad signalization, including a new Railroad signal bungalow;

d. The Developer shall be responsible for all other Elements of the UPRR Pepsi Lead Crossing, including but not limited to related Utility Work, repair of roadway approaches to at-grade crossing, roadway widening, sidewalk, traffic signalization, signalization interconnect to Railroad signal bungalow, and a stormwater detention facility, and any additional work specified in Section 10.4.10 as the Developer's responsibility. The Developer shall coordinate the scheduling of all separate Railroad Forces required for the performance of all Construction Work related to the UPRR Pepsi Lead Crossing;

e. The Department shall pay UPRR directly for the at-grade crossing modification and Railroad signalization (including the new Railroad signal bungalow). The Developer shall pay for all other costs of the UPRR Work (including associated flagging costs) directly to UPRR. Cost responsibilities of the Department to UPRR are further identified in the UPRR RRA included in the Reference Documents; and

f. The UPRR approved 30% UPRR Pepsi Lead Crossing Plans are included in the Reference Documents.

10.1.4. UPRR York Street Crossing

a. Existing conditions have the UPRR York Street Crossing at-grade with mainlines and yard lead tracks. The Construction Work includes widening York Street as it crosses the UPRR tracks to add a southbound left-turn lane and signalized intersection at 47th Avenue. In addition, reconstruction of the pedestrian crossing will be required and Railroad warning devices must be replaced with an interconnected preemption signalized system;

b. The UPRR RRA reflects UPRR approval of 30% design for the Construction Work on UPRR property including the at-grade crossing modification (30% UPRR York Street Crossing Plans). The Developer shall complete the roadway design and coordinate with UPRR to obtain approval of the 100% UPRR York Street Crossing Plans;

c. UPRR shall be responsible for providing all Railroad flagging and at-grade crossing modification including permanent and temporary crossing panels to be installed during the UPRR Crossing construction, and at-grade warning device signalization including a new Railroad signal bungalow;

d. The Developer shall be responsible for all other Elements of the UPRR York Street Crossing, including but not limited to related Utility Work and construction of the roadway, sidewalk, traffic signalization, and signalization interconnect to Railroad signal bungalow, and any additional work specified in Section 10.4.11 as the Developer's responsibility. The Developer shall coordinate the scheduling of all separate Railroad Forces required for the performance of all Construction Work related to the UPRR York Street Crossing;

e. The Department shall pay UPRR directly for the at-grade crossing modification (including the crossing panels) and Railroad signalization. The Developer shall pay for all other costs of the UPRR Work (including associated flagging costs) directly to UPRR. Cost responsibilities of the Department to UPRR are further identified in the UPRR RRA included in the Reference Documents; and

f. The UPRR approved 30% UPRR York Street Crossing Plans are included in the Reference Documents.

10.1.5. BNSF Crossing

a. Existing conditions have the I-70 Mainline passing over the BNSF on a viaduct built in the early 1960s, while the BNSF crosses 46th Avenue at-grade to service two businesses on the south side of the I-70 Mainline; Manna Pro Products and Weakland Investments, LLC (RLW Sand Storage). The Construction Work includes removal of existing I-70 viaduct bridge, bridge construction, 46th Ave and I-70 Mainline and appurtenances construction, at-grade crossings with 46th Avenue, trackwork, traffic signalization, signalization interconnect to Railroad signal bungalow, and coordination with Manna Pro and Weakland Investment's restorative improvements within the yard, and scheduling the established 9 month track outage;

b. The BNSF RRA reflects BNSF approval of:

i. 100% trackwork design for the BNSF Crossing (100% BNSF Trackwork Plans and Specifications);

ii. 30% design for the Construction Work on BNSF right-of-way including I-70 Mainline and appurtenances construction including the bridge that carries the trackwork (30% BNSF Crossing Plans). The Developer shall complete the design and coordinate with the Department for the Department to officially submit the design to BNSF to obtain approval of the 100% BNSF Crossing Plans;

c. The track responsibility demarcation is defined in the 100% BNSF Trackwork Plans and Specifications. The following responsibilities shall apply to the Construction Work for this crossing:

i. North and south of demarcation, BNSF shall be responsible for all Railroad flagging;

ii. North of the demarcation, BNSF shall be responsible for trackwork, ballast, Railroad at-grade crossings, lights and gates warning devices, and Railroad signalization including new Railroad signal bungalows;

iii. North of the demarcation, Developer shall be responsible for all other Elements of the BNSF Crossing, including but not limited to traffic control, construction of I-70 Mainline and appurtenances, bridge construction, shoring, grading, subgrade and subballast placement, traffic signalization, signalization interconnect to Railroad signal bungalows, and related Utility Work, and any additional work specified in Section 10.4.12 as the Developer's responsibility. It shall be the Developer's responsibility to coordinate the scheduling of all separate Railroad Forces required for the performance of all Construction Work related to the BNSF Crossing;

iv. South of the demarcation, the Developer shall be responsible for all grading, drainage, trackwork, and ballast construction within the BNSF right-of-way and private properties, including connections to existing track and industry facilities, and any additional work specified in Section 10.4.12 as the Developer's responsibility. Manna Pro and Weakland Investments will be responsible for procurement and coordination of modifications of their facilities to accommodate the new track geometry, and procurement and coordination of transloading deliveries during the track outage for construction;

d. The Department will pay BNSF directly for all engineering review costs, Railroad flagging costs, construction inspection costs, BNSF trackwork, ballast, Railroad at-grade crossings with 46th Avenue, lights and gates warning devices, and Railroad signalization north of the demarcation, provided that, to the extent that any work requiring Railroad flagging takes a longer period to carry out than is specified in the Developer's Baseline Schedule, the Department shall be entitled to seek reimbursement from the Developer of any Railroad flagging costs that the Department incurs pursuant to the BNSF RRA that are in excess of such costs that the Department would have incurred had the Developer carried out such work within the period specified in the Developer's Baseline Schedule (for certainty, by reference to duration of such period rather than the specific dates thereof). Cost responsibilities of the Department to BNSF are further identified in the BNSF RRA included in the Reference Documents; and

e. The BNSF approved 30% BNSF Crossing Plans are included in the Reference Documents, and the BNSF approved 100% BNSF Trackwork Plans and Specifications are included in Schedule 10B Contract Drawings.

10.1.6. DRIR Crossing

a. Existing conditions have the I-70 Mainline passing over a single track from the DRIR Silver Yard on a bridge built in the early 1960s. The Construction Work includes reconstruction of the existing I-70 bridges over the DRIR, and construction of two additional bridges to carry Quebec eastbound exit ramp and N Stapleton Drive traffic;

b. The DRIR RRA reflects DRIR approval of 30% design for the Construction Work on DRIR Right-of-Way, including the bridges that carry the I-70 Mainline, N Stapleton Drive and Quebec eastbound exit ramp over DRIR (30% DRIR Crossing Plans). The Developer shall complete the design and coordinate with DRIR to obtain approval of the 100% DRIR Crossing Plans;

c. DRIR shall be responsible to provide all Railroad flagging and modifications of their sand pad spur track to remove it from proposed CDOT ROW as defined in the DRIR RRA;

d. The Developer shall be responsible for all other Elements of the DRIR Crossing, including but not limited to traffic control, construction of I-70 Mainline and appurtenances, removal of bridges, bridge construction, shoring, grading, and related Utility Work, and any additional work specified in Section 10.4.13 as the Developer's responsibility. The Developer shall coordinate the scheduling of all separate Railroad Forces required for the performance of all Construction Work related to the DRIR Crossing;

e. The Developer shall pay for all costs of the DRIR Work (including associated flagging costs) directly to DRIR. Cost responsibilities are further identified in the DRIR RRA included in the Reference Documents; and

f. The DRIR approved 30% DRIR Crossing Plans are included in the Reference Documents.

10.1.7. Railroad Permits and Regional Transportation District (RTD) Railroad Permits

a. The Developer shall coordinate all drainage related issues, including drainage reports and storm drainage system design and construction, as related to Construction Work on Railroad or RTD right-of-way, with the affected Railroad or RTD. The Developer shall obtain, and be responsible for applicable fees, for all required approvals and Permits for storm drainage from the Railroad or RTD, as described in Schedule 18 Right-of-Way;

b. The Developer shall coordinate all proposed ITS and Utility Relocations of Public Utilities (as applicable) design and construction, as related to Construction Work on Railroad or RTD right-of-way, with the affected Railroad or RTD. The Developer shall obtain, and be responsible for applicable fees, for all required approvals and Permits for ITS and Utility

Relocations of Public Utilities (as applicable) from the Railroad or RTD, as described in Schedule 18 Right-of-Way;

c. Railroad Permit information is included in the Reference Documents.

10.2. Applicable Standards

10.2.1. The design and construction of Construction Work shall be in accordance with the relevant Railroad's written specifications, standards of practice, and construction methods. In the event of a conflict between the requirements of a Railroad and the requirements of the Project Agreement, the Department, at its sole discretion, will determine which shall govern. The Developer shall be responsible for resolution of any unresolved ambiguity prior to proceeding with any Construction Work.

10.2.2. The Developer shall comply with the requirements of the applicable RRA in performing the Construction Work.

10.2.3. The Developer shall abide by and comply with the standards and requirements of the Colorado Public Utilities Commission (PUC) in performing the Construction Work.

10.2.4. The Developer shall comply with all rules and regulations prescribed by the Railroads as to the proper manner of protecting the tracks (and the traffic moving thereon), and other property of the Railroads or their tenants at and in the vicinity of the Site during the time any Construction Work is being performed. Compliance with Railroad rules and regulations shall include execution of contractor's right-of-entry agreements and Permits required by the Railroads.

10.2.5. The Developer shall comply with the standards and requirements of the Local Agency in performing the Construction Work.

10.3. Administrative Requirements

10.3.1. The following individuals (or such other individuals as are notified to the Developer from time to time) will act as the Developer's main contacts with each of the Railroads:

a. UPRR
Mr. Lance Kippen
Manager of Public Projects
Union Pacific Railroad
1400 W. 52nd Avenue
Denver, CO 80221
Phone: 303-405-5039
Email: LKippen@up.com

b. BNSF
Mr. David Miller
Project Engineer
BNSF Railway
3700 Globeville Road
Denver, CO 80216
Phone: 303-480-6342
Email: david.miller6@bnsf.com

c. DRIR
Mr. Jason Travers
General Manager
Denver Rock Island Railroad
3400 E. 56th Avenue
Denver, CO 80221
Phone: 303-296-0900
Email: jason.travers@denverrockisland.com

10.3.2. The Developer shall meet with the Department and each of the Railroads as soon as practicable after the Agreement Date to discuss all Railroad points of concern and other items that may affect the Project Schedule. The Developer shall identify critical Activities and sequences as they affect Railroad operations, and shall plan to effectively mitigate Railroad impacts.

10.3.3. Before commencing Construction Work on Railroad right-of-way, the Developer shall enter into a right-of-entry agreement with each of the Railroads. All costs associated with applying for and complying with such right-of-entry agreements and associated Permits, including required insurance coverage, clerical, administrative, and handling expenses in connection with the processing of such agreements and Permits, shall be borne by the Developer and, for certainty, any differences between the terms of the form of a right-of-entry agreement set out in any executed RRA or any draft RRA provided in the Reference Documents and the terms negotiated and entered into by the Developer shall not constitute the basis for a Supervening Event claim as the result of the occurrence of a Compensation Event falling within paragraph o.i.A of the definition thereof in Part A of Annex A (*Definitions and Interpretation*) of the Project Agreement.

10.3.4. Railroad Insurance

The Developer shall comply with the provisions for Railroad insurance as specified in the executed right-of-entry agreement with the Railroads and in the terms and conditions of the Project Agreement.

10.3.5. Railroad Flagging and Inspection

a. Any Construction Work or equipment that could potentially fall within 25 feet of the centerline of an active track shall require a Railroad flagger. The Developer shall notify the Railroad, in accordance with the executed right-of-entry agreement with the Railroad, to arrange for required flagging services. The Developer shall provide an advance notice, as specified in the executed right-of-entry agreement, to the Railroad for the need of Railroad flagger services. The Developer shall be responsible to appropriately notify the Railroad regarding flagging start and end dates for work on the Railroad right-of-way. The Developer shall provide advance notice, as specified in the executed right-of-entry agreement, to the Railroad when all Construction Work on the Railroad right-of-way is scheduled for completion to provide for termination of Railroad flagger services;

b. During the period of construction, all flagging and protective services shall be performed strictly in accordance with directives and instructions issued by the applicable Railroad. The Developer shall confer with the Railroads for the times, locations, and manner of such protective measures. The Developer shall include the Railroad flaggers in all its regularly scheduled safety meetings;

c. The Railroad may utilize independent consultant services to inspect and verify that any and all Construction Work on Railroad right-of-way is being undertaken in accordance with Railroad safety requirements. Failure to comply with Railroad safety requirements may result in the Railroad issuing a stop work order;

d. Costs for Preliminary Engineering, Flagging, Inspection and Design Reviews

i. Before submitting design plans to the UPRR or DRIR for approval, the Developer shall enter into a preliminary engineering review agreement with the respective Railroad for design review costs;

ii. Except to the extent the Department is responsible for such costs pursuant to Sections 10.1.2.e, 10.1.3.e, 10.1.4.e and 10.1.5.d, the Developer shall be responsible for the cost of Railroad flagging, Railroad inspection, Railroad placement and maintenance of temporary crossings and service roads, Railroad right-of-entry agreements, permitting and coordination fees, Railroad design plan review costs, and other Railroad related costs. The estimated cost for one flagger ranges between for an eight hour basic day with time and one-half or double time for overtime, rest days and holidays. Work days longer than eight hour days, and double shifts will require the utilization of additional Railroad

flaggers. The flagging costs, provided in the RRAs, shall be understood to be approximate only, and no guarantee is made that the total cost of such flagging will not be in excess of the estimated amount;

iii. Notwithstanding the rates specified above in this Section, the rates of pay of the Railroad employees customarily called upon to act for the protection of the Railroad shall be the Railroad rates in effect at the time of the Construction Work for the various classes of labor. Compensation, property damage and public liability insurance, vacation and holiday time, Railroad retirement and unemployment taxes, health and welfare, and supervision charges shall be added to such rates; and

e. The Developer shall accommodate any and all requests made by the Railroads that serve the purpose of avoiding hazards to Railroad property and/or operations. Neither the Railroads nor the Department have any liability to the Developer for costs or delays associated with such Construction Work stoppage or requirements associated with avoidance of hazardous situations.

10.3.6. Design Reviews

a. The applicable Railroad will approve design plans for the Construction Work to be performed by the Developer on the Railroad right-of-way. Railroad reviews are separate and independent from submittals required to be made to the Department. The Developer shall coordinate the required Railroad submittals to the UPRR and DRIR for approval via the appropriate Railroad main contact. The Developer shall coordinate the required Railroad submittals to the BNSF for approval via the Department for official submittal to BNSF;

b. Railroads will be required to approve design plans in writing for all of the design Elements of the Construction Work within or crossing the Railroad right-of-way prior to initiation of construction.

10.3.7. If the Developer is employed upon or directly adjacent to the Railroad right-of-way and performs the Construction Work thereon contrary to the Railroad-approved plans, specifications, and requirements of the Project Agreement or applicable RRA, or if the Developer performs the Construction Work on the Railroad right-of-way in a manner deemed hazardous by the Railroad (to its property and facilities or the safe and expeditious movement of its traffic), the Railroad will have the right to stop all Construction Work on the Railroad right-of-way until the acts or omissions of the Developer have been fully rectified to the satisfaction of the Railroad.

10.3.8. The Developer shall be responsible to the Railroad and its tenants for all damages for delays that may be sustained by the Railroad, its tenants, their employees, or freight in their care caused by interference that could have been avoided by performance of the Construction Work in accordance with the requirements of the Project Agreement and the applicable RRA.

10.3.9. All of the limitations and obligations imposed upon the Developer by this Section shall apply with equal force and effect to any Subcontractor performing any Construction Work for the Developer within the Railroad right-of-way. The Developer shall be primarily liable and responsible to the Railroad for all acts or omissions of any Subcontractor. Nothing herein contained shall be construed to preclude the Railroad from proceeding against the Developer, subcontractors, suppliers, or consultants individually or collectively.

10.3.10. The Developer shall not pursue any levies, liens, or encumbrances of any nature whatsoever against Railroad property, and shall promptly remove any lien against Railroad property arising from performance of Construction Work hereunder by the Developer or any Subcontractor.

10.3.11. Except to the extent the Department is responsible for such costs pursuant to Section 10.1.5.d, the Developer shall be responsible for the cost of all personnel deemed necessary by the Railroad and provided by the Railroad for the protection of the Railroad facilities and trains during the period of Construction Work, and the cost of installing protective devices in the case of impaired clearance, as above specified.

10.3.12. The requirements of the Railroads and the instructions of their representatives shall be strictly adhered to by the Developer, and its Subcontractors. At the request of the Railroads, the Developer shall remove from the Railroad right-of-way any employee of the Developer or any Subcontractor who fails to conform to the instructions of a Railroad's representative. All Construction Work on the Railroad right-of-way shall be suspended until such request of the Railroad is met. The Developer shall indemnify the Railroad against any claim arising from the removal of any such employee from the Railroad premises.

10.3.13. Railroads are not responsible for Utilities on Railroad right-of-way. The Developer shall identify and locate all existing Utilities on Railroad right-of-way within the immediate vicinity of the Construction Work. The Developer shall certify to the Railroad that all the Utilities on Railroad right-of-way and within the immediate vicinity of the Construction Work have been identified, located and properly addressed for Utility Work.

10.4. Construction Requirements

10.4.1. The Developer shall coordinate with the Railroad prior to beginning any construction on or directly adjacent to the Railroad right-of-way. The Developer shall schedule and hold a Railroad pre-construction conference with the affected Railroad. Working windows for demolition and construction shall be coordinated with the Railroads and Railroad flaggers.

10.4.2. The Developer shall coordinate with the Railroad to establish the construction schedule for the start and anticipated completion of all construction work to be undertaken by the Railroad and by the Developer. The Developer shall obtain approval of the construction schedule and any updates from the applicable Railroad, and include the approved schedule within the Developer's initial Baseline Schedule and any Revised Baseline Schedule.

10.4.3. The Developer shall obtain Railroad approval in writing, in advance of construction Activities, on methods and procedures for all Construction Work.

10.4.4. Upon completion of the Construction Work to be performed within or directly adjacent to Railroad right-of-way, the Developer shall promptly remove from Railroad right-of-way all tools, equipment, and materials placed thereon by the Developer. The Developer shall restore said property to the same state and condition as when the Developer entered thereon and shall leave said right-of-way in a clean and presentable condition satisfactory to the Railroad.

10.4.5. The Developer shall perform Construction Work in accordance with plans and specifications approved by the Railroad and in such manner and at such times as shall not endanger or interfere with the safe operation of the tracks and property of the Railroad and the traffic moving on such tracks, as well as wires, signals, and other property of the Railroad, its tenants or licensees, at or in the vicinity of the Construction Work. The Developer shall not pile or store any materials, tools, or park any equipment, when not in use, closer to the center of nearest Railroad track than permitted by the following clearances:

a. 25 feet, 0 inches horizontally from centerline of the nearest rail; and

b. 23 feet, 6 inches vertically above top of rail.

Any proposed temporary construction variance of the above clearances shall be submitted by the Developer to the Railroad, the PUC (if applicable), and to the Department. The variance shall not be undertaken until approved by the Railroad and until the Department has obtained necessary authorization from all governmental bodies having jurisdiction.

10.4.6. If required, temporary at-grade crossings with the Railroad tracks or service roads within Railroad right-of-way will be constructed by the relevant Railroad Forces. If required, the Developer shall execute a Temporary Crossing Agreement with the Railroad. The Developer shall only enter Railroad right-of-way through routes approved by the applicable Railroad. The Developer shall maintain any such crossings so established in good condition at all times; shall keep flange-ways free of ice, snow, dirt, rock and debris; and shall install, operate, maintain and remove in a manner satisfactory to the Railroad suitable gates or barricades adequate to prevent unauthorized vehicles or equipment from using such temporary crossings. All costs and

expenses for installation, maintenance, and operation of any such crossings and barricades, whether performed by the applicable Railroad or by the Developer, shall be borne by the Developer. The Developer shall not, at any time, cross a Railroad's tracks with vehicles or equipment of any kind, except at existing public crossings or at temporary crossings established, as provided for in this Section 10.

10.4.7. The Developer shall provide positive drainage along the Construction Work at all times for the duration of the Project.

10.4.8. Developer shall provide traffic control as necessary for construction performed by Railroad Forces.

10.4.9. UPRR Crossing

a. The UPRR mainlines, yard track, lead track and Railroad signalization shall be reconstructed in accordance with the 100% UPRR Trackwork Plans and Specifications and construction phasing design. Track shooflies and other temporary track, as set forth in the 100% UPRR Trackwork Plans and Specifications, shall be constructed to move rail traffic away from new bridge construction while maintaining connectivity and operations of all mainline and yard tracks;

b. The Developer shall provide the following Construction Work Elements in accordance with the requirements of the Project Agreement and the UPRR RRA:

i. Removal of existing UPRR bridge (E-17-Z) over 46th;

ii. Construction of UPRR bridges (E-17-AEW and E-17-AEX) over the I-70 Mainline, 46th Avenue, and sidewalks;

iii. Temporary and permanent ballast and trackwork outside the 13 foot clear point of existing track as identified in the 100% UPRR Trackwork Plans and Specifications;

iv. Reconstruction (including interim repairs as necessary) of York Street roadway approaches to at-grade crossing work;

v. Service road bridge and crossing approaches providing a minimum 12' wide driving surface;

vi. Grading, drainage and subballast for all temporary and permanent track;

vii. Relocation of Utilities across the UPRR bridges in accordance with Schedule 10, Section 4 Utilities; and

viii. Removal of existing I-70 viaduct bridge (E-17-FX).

c. During the UPRR bridge construction, the Developer shall provide a temporary 12 foot wide minimum service road crossing under the existing I-70 viaduct until the permanent service road and bridge can be placed in service;

d. Temporary and permanent trackwork and Railroad signalization are required to construct the UPRR Crossing over the Lowered Section;

e. Temporary and permanent track shifts, track tie-ins and associated ballast identified in the 100% UPRR Trackwork Plans and Specifications will be constructed by the UPRR;

f. All temporary and permanent electronic train management system infrastructure will be constructed and maintained by the UPRR;

g. The Developer shall maintain existing Railroad operations, without any closures, at all times; and

h. Refer to Schedule 10, Section 13 Structures for requirements and coordination, as it relates to the UPRR Railroad and service road bridges.

10.4.10. UPRR Pepsi Lead Crossing

a. The UPRR Pepsi Lead Crossing track and roadway shall be protected, and the at-grade crossing with Brighton Boulevard modified while maintaining connectivity and operations of the existing track and roadway;

b. The Developer shall provide the following Construction Work Elements in accordance with the Project requirements of the Project Agreement and the UPRR RRA:

i. Modification of Brighton Boulevard roadway and sidewalk approaches to the at-grade crossing;

ii. Replacement of CCD owned traffic signal including poles, heads and controller, and reestablishment of interconnect to UPRR signalization;

iii. Relocation of Utilities in accordance with Schedule 10, Section 4 Utilities;

c. At-grade crossing shall meet the requirements of Americans with Disabilities Act (ADA) *Accessibility Guidelines*; and

d. The Developer shall maintain existing Railroad operations, without any closures, at all times.

10.4.11. UPRR York Street Crossing

a. The York Street widening and at-grade crossing improvements shall not be constructed prior to completion of the UPRR Crossing track reconstruction work. All UPRR track, regardless of construction status shall be protected, and the at-grade crossing with York Street modified as part of the York Street widening construction work. The Developer shall maintain connectivity and operations of all track and roadway;

b. The Developer shall provide the following Construction Work Elements in accordance with the Project requirements of the Project Agreement and the UPRR RRA:

i. Modification of York Street roadway and sidewalk approaches to the at-grade crossing;

ii. Installation of CCD owned traffic signal including poles, heads and controller, and establishment of preemption system and interconnect to UPRR signalization;

iii. Relocation of Utilities in accordance with Schedule 10, Section 4 Utilities;

c. Warning devices for roadway at-grade rail crossings shall be installed by UPRR; and

d. The Developer shall maintain York Street pedestrian access across the tracks at all times during construction.

10.4.12. BNSF Crossing

a. The BNSF Market Lead track shall be reconstructed in accordance with the 100% BNSF Trackwork Plans and Specifications. The existing track will be temporarily taken out of service to allow bridge and trackwork construction. Developer shall provide a minimum of 90 day prior notice to schedule the beginning of the track outage and the termination of the track outage with BNSF, Manna Pro Products, and RLW Sand Storage. A temporary track outage of 9 months has been established. Track outage is the duration from the beginning of track outage that stops rail delivery service to the completion of the track outage when rail delivery service resumes by way of new track work and bridge. Manna Pro Products and RLW Sand Storage shall be responsible for transloading deliveries during the established track outage. The Developer shall be responsible for all additional transloading costs surpassing the established track outage;

b. The Developer shall provide the following Construction Work Elements in accordance with the requirements of the Project Agreement and the BNSF RRA:

i. Construction of BNSF bridge (E-17-AFA) over the I-70 Mainline;

ii. Grading, drainage and subballast for trackwork north of the demarcation; and

iii. Grading, drainage, subballast and ballast, and all trackwork south of the demarcation;

iv. Relocation of Utilities in accordance with Schedule 10, Section 4 Utilities;

v. Removal of existing I-70 viaduct bridge (E-17-FX).

c. Warning devices and crossing material for roadway at-grade rail crossings shall be installed by BNSF north of the demarcation referenced in Section 10.1.5.c;

d. At-grade crossings shall meet the requirements of Americans with Disabilities Act (ADA) *Accessibility Guidelines*;

e. Refer to Schedule 10, Section 13 Structures for requirements and coordination, as it relates to the BNSF Railroad bridge; and

f. The Developer shall coordinate the excavation and backfill material management on BNSF right-of-way with BNSF, and shall comply with BNSF's environmental policy and practice, and with Schedule 17, Environmental Requirements. BNSF environmental policy information is included in the Reference Documents.

10.4.13. DRIR Crossing

a. The DRIR track shall be protected during removal of the existing bridges and the construction of I-70 Mainline bridges, Quebec Street ramp bridge, and Stapleton Drive North bridge while maintaining connectivity and operations of the existing track;

b. The Developer shall provide the following Construction Work Elements in accordance with the requirements of the Project Agreement and the DRIR RRA:

i. Removal of existing bridges (E-17-EW and E-17-DF);

ii. Construction of eastbound and westbound I-70 bridges (E-17-AFO and E-17-AFN) over the DRIR track;

iii. Construction of new Quebec Street eastbound exit ramp bridge (E-17-ADU) and N Stapleton Drive bridge (E-17-ADT) over the DRIR track;

iv. Grading and drainage;

v. Relocation of Utilities in accordance with Schedule 10, Section 4 Utilities;

c. Horizontal openings under each bridge should accommodate a future parallel track east of the existing DRIR track; and

d. Refer to Schedule 10, Section 13 Structures for requirements and coordination, as it relates to the DRIR Railroad bridges.

10.4.14. Subgrade Cross Slope and Track Superelevation

a. All new and reconstructed track sections shall be designed and constructed with subgrade/subballast cross slopes in accordance with the requirements of the applicable Railroad and 100% approved design;

b. Superelevation shall be applied to mainline track only, unless otherwise directed by the applicable Railroad. Superelevation rate and transition length for mainline track reconstruction shall be in accordance with the 100% approved design;

c. Ballast Slopes (Track Roadbed)

i. Ballast slopes shall be constructed in accordance with 100% approved design or as specified by the applicable Railroad's standards;

ii. Ballast roadbed areas shall be constructed with ditches, underdrains and storm sewer as necessary to direct drainage away from the track roadbed;

d. Cut slopes beyond the trackside ditch shall be constructed in accordance with 100% approved design or as specified by the applicable Railroad's standards; and

e. All cut slopes shall be rounded at their matches to existing ground.

10.4.15. Colorado Public Utilities Commission Approvals

a. All new, modified, and/or reconstructed at-grade crossings, grade separated Railroad/highway crossings, and pedestrian crossings of commercial rail lines will require approval of the Colorado Public Utilities Commission (PUC). Locations anticipated to require PUC approval are:

i. I-70 restriping over BNSF and RTD near Washington Street (DOT# 057-080F);

ii. UPRR Crossing (DOT# 804-269C & 804-266G);

iii. UPRR Pepsi Lead Crossing (DOT# 804-397K);

iv. UPRR York Street Crossing (DOT# 804-422R);

v. BNSF Crossing (DOT# 057-038G);

vi. DRIR Crossing (DOT# 594-977N);

vii. I-70 restriping over UPRR Arsenal Lead near Havana Street (DOT# 804-689G);

b. In accordance with PUC Regulations (4 CCR 723-7:7203), only the roadway or Railroad authority in highway-rail crossings may petition or apply to the PUC. The Department will apply in respect of the locations specified in Sections 10.4.15.a.i, ii, vi, and vii above, and the Department and CCD will jointly apply in respect of the locations specified in Sections 10.4.15.a.iiiii, iv, and v above for the highway-rail crossing PUC authorizations necessary for the Project. The Developer shall support the Department in these efforts by the following:

i. The Developer shall be responsible for preparing all applications to be submitted to the PUC, including developing the application text and all supporting documentation, and preparing exhibits to the satisfaction of the PUC and for Approval by the Department;

ii. The Developer shall attend meetings with appropriately qualified staff and cooperate with the PUC as reasonably requested by the Department;

iii. The Developer shall obtain CCD approval (as applicable) of the proposed application in advance of any submittal to the PUC;

iv. The Developer shall prepare and coordinate any post application exhibits and/or information requested by the PUC, including providing technical expertise at any PUC legal proceedings, as requested by the Department; and

v. The Developer shall allow for appropriate PUC approval durations in the Project Schedule and shall provide the applications and supporting documentation in a timely fashion to the Department to prevent delays to the Construction Work. Any delays or increase in costs of the completion of the Project caused by the failure of or delay by the Developer to provide the PUC applications and supporting documentation to the Department shall be the responsibility of the Developer.

10.4.16. Public Access

The Developer shall obtain CCD approval of the locations of any Railroad maintenance access points taken from public ROW. Access location and gate location shall consider its relation to roadway traffic operations and ensure that Railroad maintenance vehicles are stopped/parked outside of traffic lanes and pedestrian walks.

10.4.17. Fencing

a. The Developer shall provide temporary fencing as required to protect Railroad right-of-way from unauthorized access and cut-through traffic during construction. Temporary fence shall be of material, dimensions and placement that will prevent vehicle and pedestrian entry, and provide noise and dust mitigation at required locations. The Developer shall consult with property owners adjacent to Railroad ROW regarding location, type, and height of temporary fence. Gates for construction access shall be placed in locations designated in the Developer's plans and approved by the Railroad;

b. The Developer shall depict the permanent fencing limits on the plans for Railroad approval to provide permanent fencing of types, in accordance with Railroad standards and requirements, in the following locations:

   i. UPRR right-of-way line north and south of proposed Railroad bridge;

   ii. BNSF right-of-way line south of proposed 46th Avenue (east side only);

   iii. BNSF right-of-way line north of proposed 46th Avenue;

   iv. DRIR right-of-way line north and south of proposed I-70 Mainline;

   v. UPRR industrial track right-of-way line south of the I-70 Mainline, between Havana Street and Peoria Street;

c. The Developer shall provide gates in fences at locations and of width and type as approved by the Railroad for maintenance access; and

d. All fencing materials, temporary and permanent, shall be selected in accordance with the guidelines established in Schedule 10, Section 14 Landscaping and Aesthetics.

10.5. Deliverables

At a minimum, the Developer shall submit the following to the Department for Information, Acceptance, or Approval in accordance with the timeframes specified:

Table 10-1 Deliverables

Deliverable	Information, Acceptance, or Approval	Schedule
Copies of Railroad notices, submittals, approvals, and correspondences	Information	Prior to RFC Documents
BNSF Design review submittal	Acceptance	As required by this Section 10
PUC applications (all locations)	Approval	Prior to RFC Documents
Railroad Permits and Regional Transportation District Railroad Permits	Approval	Prior to RFC Documents

11. SIGNING, PAVEMENT MARKINGS, SIGNALIZATION, AND LIGHTING

11.1. General

The Developer shall be responsible for the design and installation of all permanent and temporary signing, pavement marking, signalization, and lighting Elements required for the Project. Permanent and temporary signing, lighting, and other traffic control devices shall be provided to facilitate and maintain the safe flow of traffic for the completed Construction Work elements for all phases of the Construction Work. The Developer shall replace existing signing and pavement markings outside of the Site that are rendered inaccurate, ineffective, or confusing by the Construction Work.

The Developer shall be responsible for maintenance of traffic signals and lighting in accordance with Schedule 11 Operations and Maintenance Requirements.

11.2. Applicable Standards

11.2.1. Unless otherwise stated, the Construction Work requirements shall apply to permanent as well temporary signing, pavement marking, signalization and lighting. The design shall comply with the requirements of this Section and the Construction Standards.

11.2.2. The design shall include electrical designs and power requirements for the respective Construction Work Elements. The Developer shall comply with the Utility service requirements specified in Schedule 10, Section 4 Utilities and coordinate with the relevant electrical Utility companies and the Electronic Toll Collection (ETC) System Integrator to determine electric power requirements for the Construction Work.

11.2.3. Signing and pavement marking designs shall comply with the requirements of the CDOT Standard Specifications, *M & S Standard Plans*, *Sign Design Manual*, CDOT Signing Policies and Procedures, Colorado Supplement Signs and the most current version of the Federal Highway Administration (FHWA) *Manual for Uniform Traffic Control Devices* (MUTCD), Colorado Supplement to the Federal Manual on Uniform Traffic Control Devices, and the Standard Highway Signs 2012 Supplement. The requirements of the MUTCD shall include both the standard requirements and the guidance recommendations of the manual. The design shall address all necessary modifications to existing permanent signing inside and outside the Site.

11.2.4. Local Agency signing, pavement markings, and signals on Local Agency Roadways shall comply with the Local Agency standards.

11.3. Signing

11.3.1. Signing Design

a. Permanent signing shall include all necessary guide, warning, supplemental, tolling, informational, school zones, Railroad, and regulatory, etc., signs for the Project, including signing on adjacent Local Agency Roadways, arterials and highways outside the Site. These signs shall be required to be installed as new at the appropriate locations in coordination with the design and Accepted by the Department prior to installation;

b. The Local Agency Roadway, arterials, and highways currently display existing signing to direct vehicles to I-70. These signs shall be replaced with new signs to incorporate the new legend and additional signs provided as required;

c. The requirements of the MUTCD shall include both the standard requirements and the guidance requirements of the manual;

d. The Interstate Access Request (IAR) includes the Phase 1 signing and striping concept plan. The IAR shows the intent of signing for General Purpose Lanes and Tolled Express Lanes and has been approved by FHWA. Any changes to the IAR that do not follow the intent of the IAR shall require re-evaluation of the IAR and approval by FHWA. The Developer shall be responsible to provide the Department with all documentation and Information required to obtain the IAR re-evaluation approval.

e. A Project Signing and Striping Concept Drawing is provided in the Reference Documents. The Signing and Striping Concept Drawing is not all inclusive or final but shall be used as a basis for the development for the Developer's final design. These drawings follow the MUTCD and the Colorado Supplement to the MUTCD. Also, shown on this Signing and Striping Concept Drawing are signing additions that are not identified in the MUTCD or the Colorado Supplement to the MUTCD. These additions are as follows and shall be included on the Project:

   i. Special lane reduction overhead warning signs shall be included for lane drops as shown on the Project Signing and Striping Concept Drawing and at the end of any tolling ingress merge lane;

   ii. MUTCD interchange sequence signs shall be placed over the right lane. The right edge of sign shall line-up with the right shoulder lane line;

   iii. Interchange sequence signs shall replace the first required advance guide sign for each minor and intermediate interchange;

   iv. Preferential lane ends and ½ mile advance preferential lane ends regulatory signs shall be mounted overhead;

   v. Advance 1 mile express lane entrance guide signs shall be installed on northbound I-25 to eastbound I-70, northbound I-225 to westbound I-70, WB Chambers Road collector-distributor road, and southbound I-25 to eastbound I-70;

   vi. At egress locations with merge lanes, the required overhead pull-through sign and intermediate egress direction sign shall be installed both at the point where the merge lane develops and at the start of the merge area;

   vii. A 2 mile advance guide sign shall be installed on I-70 2 miles in advance of the initial entry point to the express lane in both the eastbound and westbound directions and on southbound Pena Boulevard to westbound I-70;

   viii. Signing for express lane entrance directional and advance VTMS shall be located over the left-most General Purpose Lane; and

   ix. All signs for Pena Boulevard shall include both wording for Pena Boulevard and an airport symbol as shown on Project Signing and Striping Concept Drawing.

f. The Developer shall submit sign layouts for all special signs of any size to the Department for Acceptance;

g. During the Construction Period the Developer shall re-set the existing permanent signs on the I-70 Mainline that display the LOGOS. The Developer shall coordinate with the contractor responsible for managing the LOGOS program for the correct placement of these signs. Contact information for the LOGOS program can be found at www.colorado.interstatelogos.com. At the end of the Construction Period these signs shall be incorporated into the Permanent Signing Plan at the direction of the LOGOS program manager following the Approval from the Department;

h. The Developer shall coordinate with the Regional Transportation District (RTD) to replace wayfinding signs for RTD stops and stations in and outside the Site. If existing wayfinding signs require removal, alternative equivalent signs shall be replaced, as directed by RTD;

i. Mile markers are required for the entire length of the Project and shall be displayed every 0.1 mile. In addition, delineators are required. Mile markers and delineators shall be installed in accordance with the Construction Standards;

j. Signing designs shall include details of size, legend and locations of ground-mounted and overhead signs, dimensions of Class III sign supports, layouts/dimensions of all special signs, and structural and foundation requirements. Details to be submitted shall include structure cross sections, display signing mounting, hangers, equipment, control boxes,

conduits, holes, hand holes, vertical clearances, the Right-of-Way (ROW) line, Utility conflicts, panel sizes, tolling attachments, all Intelligent Transportation Systems (ITS) attachments, Active Traffic Management (ATM) elements, cabinets, conduit locations, caisson foundation sizes and depths, shoulder, General Purpose Lane and Tolled Express Lane widths, correct sign placement over each lane, direction, barrier protection type, station and offset, etc. Refer to Schedule 10, Section 13 Structures for requirements and coordination;

k. Where CDOT sign structure standards cannot be met, the Developer shall submit alternative designs, such as custom designed monotube sign structures and foundations, for Approval. Permanent signage on Bridges shall not be hung from or be attached to the face of Bridge superstructures. Existing signs attached to Bridge superstructures shall be removed and replaced with monotube sign bridges or cantilever structures with new signs. Refer to Schedule 10, Section 13 Structures for requirements and coordination;

l. Subject to Schedule 10, Section 3.8.10.a with respect to AVIs, the Developer shall mount all overhead signs along the I-70 Mainline with a minimum vertical clearance of 17.5 feet and a maximum of 18.5 feet measured from the roadway surface under the sign panels. Structure cross sections shall be submitted and display signing mounting, hangers, equipment, control boxes, conduits, holes, hand holes, vertical clearances and all dimensions. Refer to Schedule 10, Section 3 ITS and Tolling Equipment for requirements and coordination;

m. Sign lighting on overhead guide signs shall not be permitted;

n. Unless stated otherwise, walkways shall not be permitted on overhead guide sign structures;

o. Advance signing shall be required on all the approaches of I-270, I-225, and I-25 to inform drivers of Tolled Express Lanes on I-70;

p. All freeway advance guide signs and exit direction signs shall be placed overhead; and

q. Overhead guide signs incorporating lane use information shall be installed on exit ramps in advance of ramp terminal intersections where there are multi-lanes on the ramp approach to the intersection; at entrance ramps where diverge points are located between the ramp terminal intersection and the entrance gore; and approaches to cross streets where two same directional turn lanes do not lead to the same roadway. The Signing and Striping Concept Drawing shall be used as a basis for the development for the Developer's final signing design.

11.3.2. Signing Materials

a. The materials for sign posts for each class of sign shall comply with the respective requirements of the Construction Standards. The use of wood posts for mounting ground signs is not permitted and all Class I and Class II sign posts shall use schedule 80 in lieu of schedule 40 material;

b. All Class I, II, and III ground signs shall include breakaway devices per CDOT S-*Standard Plans*. Guide signing on approaches to interstate interchanges on Local Agency Roadways and arterial roadways shall include advance entrance directional signing. On major cross streets that do not access the I-70 Mainline, supplemental I-70 directional route marker assemblies are required;

c. Signs on Local Agency Roadways shall be per Local Agency standards for materials, except for Class III signs, which shall be per CDOT S-Standard Plans;

d. Retroreflective sheeting shall be Type IV and Type XI as defined in the CDOT *Retroreflective Sheeting Materials Guide* and shall conform to Subsections 713.04 and 713.06 when applicable. For all permanent signs, the legend, borders, and background

shall be Type XI. The retro reflective sheeting standards are subject to change and the most current type prior to manufacturing shall be used; and

e. Re-use or resetting of any of the existing sign structures, ground signs, and their components shall not be permitted. All signs and structures shall be new and customized to fit the roadway conditions.

11.3.3. Existing Signing

Prior to the issuance of NTP 2, the Developer shall submit an inventory of all existing signs within the Site, including all approaches, in Microstation format to the Department for Information. The Developer shall be responsible for the removal and disposal of the existing sign structures, ground-mounted signs, and delineators affected by the Construction Work.

11.4. Pavement Marking

11.4.1. Pavement Marking Design

a. Pavement marking design shall include all striping required for center lines, edge lines, lane lines, channelization, gore and buffer cross hatching areas, lane drops, merging lanes, chevrons, transition lanes, dotted lane extensions (including dual left-turn lanes), Tolled Express Lanes (including symbols and wording), arrows (including thru-rights and merge), legends, symbols, crosswalks, school, handicap, bicycle words and symbols, stop lines, Railroad and other striping, as well as any modifications required for transitions to existing pavement markings.

b. Pavement marking route shield symbols are required at interstate system to system approaches and out of direction turn lane movements. The route shield symbols shall be placed on interstates;

c. The Tolled Express Lanes shall incorporate ingress, egress, and weave (within the ingress/egress zones) lanes. The Signing and Striping Concept Drawing shall be used as a basis for the development for the Developer's final design;

d. Where existing pavement marking is to be retained requiring only reconfiguration of existing striping, the stripes shall be removed and replaced according to Best Industry Practice. Stripes shall not be placed on longitudinal joint lines; and

e. Pavement marking for crosswalks located at the intersection of 46th Avenue and Columbine Street and the intersection of 46th Avenue and Clayton Street shall meet CCD Community Streets Program for artistic cross walks.

11.4.2. Pavement Marking Materials

All new pavement markings shall be compliant with Table 11-1.

Table 11-1 Pavement Marking Materials

Color	Retro-reflectivity Reading (R) in a one-mile section (mcd/m^2/lux)
White	R $\geq$ 400 (Newly applied marking less than 3 weeks old) Newly applied marking minimum 400 mcd/m^2/lux. Less than this reading for newly applied marking; remove and replace, impose a Working Time Violation Incident and stop work.
Yellow	R $\geq$ 250 (Newly applied marking less than 3 weeks old) Newly applied marking minimum 250 mcd/m^2/lux. Less than this reading for newly applied marking; remove and replace, impose a Working Time Violation Incident and stop work

Developer shall use a calibrated retro-reflectometer and perform the test on each line strip in conformance with ASTM E 1710 or AASHTO TP111 procedures. Developer shall collect the following readings for each day striping test is being conducted:

a. Within a mile test section, collect 10 readings for each longitudinal line stripe, at no less than 40 feet intervals; and
b. Where striping is less than 500 feet in length, collect reading at 50 foot intervals.

Readings collected shall be averaged. Excess beads to be removed prior to test.

11.4.3. For pavement markings located within the Limited O&M Work roadway sections, the Project Special Provisions, Schedule 10, Section 11, Appendix A, Revision of Section 627 and 713 Preform Thermo-Plastic Pavement Marking and Table 11-2 shall apply.

Table 11-2 Pavement Marking Materials for Limited O&M Work Roadway Sections

Pavement Marking Type	Asphalt	Concrete
Edge Line	Modified Epoxy	Modified Epoxy
Lane Line	Preform Plastic Type I (Inlaid)	Preform Plastic Type II (Inlaid)(7 inch contrast)
Channelization/Drop Lane Line	Preform Plastic Type I (Inlaid)	Preform Plastic Type II (Inlaid) (11 inch contrast)
Gore Line	Preform Plastic Type I (Inlaid) *	Preform Plastic Type II (Inlaid) (11 inch contrast)*
Hatching Line	Preform Plastic Type I	Preform Plastic Type I
Crosswalks/Stop Bars/Words/Symbols	Preformed Thermoplastic	Preformed Thermoplastic

*Or Modified Epoxy in same widths

11.4.4. Existing Pavement Marking

Prior to the issuance of NTP 2, the Developer shall submit an inventory of all existing striping within the Site including approaches, in MicroStation and Excel format, to the Department for Information.

11.5. Traffic Signalization

11.5.1. Traffic Signal Design

a. Traffic signals on Local Agency Roadways shall comply with the Local Agency Standards at time of the Setting Date and as outlined in Schedule 10, Section 11, Appendix A;

b. Traffic signalization design shall include traffic signal mast arm type poles, pedestal poles, pole footing/caisson locations and sizes, mast arm lengths, traffic signal heads, countdown pedestrian signal heads, signal head placement and alignment, controller cabinet(s), power disconnect and meter, signal phasing, lighting/luminaires, conduits, pull boxes, non-invasive vehicle detection, pedestrian push buttons, emergency vehicle preemption, CCD traffic surveillance cameras, Railroad signal preemption design, Americans with Disabilities Act (ADA) compliant curb ramps, signal timing plan, and signing as required;

c. All traffic signals shall be interconnected with 3-inch conduit and 12 strand fiber optic cable (minimum 6 single mode, 6 multi-mode) between signal cabinets at each location. Replacements to match existing fiber optic cable. Fiber shall not be spliced between cabinets or splice points unless Approved by the Department. New traffic signal installations require an electric meter pedestal cabinet and base for the traffic signal. The electrical meter will be furnished by Xcel Energy. The Developer shall install the electric meter cabinet, pedestal base, and power in conduit to meter;

d. Traffic signal pole locations shall be staked and Accepted by the Department and the CCD before construction. Mast arms shall not be installed at a diagonal in the intersection unless Approved by the Department;

e. Identified locations of traffic signalization (not all inclusive):

i. Brighton Boulevard and 46th Avenue (North and South of I-70);

ii. Brighton Boulevard and 47th Avenue;

iii. Brighton Boulevard and UPRR Pepsi Lead Crossing;

iv. Brighton Boulevard and 44th Street;

v. York Street and 46th Avenue (North and South of I-70);

vi. York Street and 47th Avenue with pre-signal at Railroad crossing;

vii. Josephine Street and 46th Avenue (North and South of I-70);

viii. Josephine Street and 45th Avenue;

ix. Columbine Street and 46th Avenue (North and South of I-70);

x. Clayton Street and 46th Avenue (North and South of I-70);

xi. Fillmore Street and 46th Avenue (North and South of I-70);

xii. Steele Street and 45th Avenue;

xiii. Steele Street/Vasquez Boulevard and 46th Avenue (North and South of I-70);

xiv. Vasquez Boulevard and 48th Avenue;

xv. Cook Street and 46th Avenue (North and South of I-70);

xvi. Monroe Street and 46th Avenue with pre-signal at Railroad crossings (North and South of I-70);

xvii. Colorado Boulevard and 46th Avenue (North and South of I-70);

xviii. Colorado Boulevard and 48th Avenue

xix. Dahlia Street and Stapleton Drive (North and South of I-70);

xx. Holly Street and Stapleton Drive (North and South of I-70);

xxi. Monaco Street and Stapleton Drive (North and South of I-70);

xxii. Quebec Street and I-70 Mainline ramps (North and South of I-70); and

xxiii. Peoria Street and I-70 Mainline ramps (North and South of I-70);

f. Temporary traffic signal and timing plans shall be designed, as necessary, to facilitate re-construction of any existing signalized intersection. Span wire type installations are permitted for temporary signals only. Poles shall be placed at locations that will facilitate all stages of intersection reconstruction and must meet clear zone requirements. Noninvasive loops are permitted for temporary installations. All traffic signal pole locations shall be staked in the field and approved by CCD and Accepted by the Department before installations. All traffic signal timing plans shall be coordinated and approved by CCD prior to implementation. The plans shall be submitted for Acceptance to the Department prior to implementation for both temporary and permanent installations;

g. Modifications to existing infrastructure in any way shall not be allowed and will require new installations, unless otherwise stated in the Project Agreement. This can include additions/modifications such as signal heads, foundations, longer mast arms, lighting, drilling holes, adding wire, and all signal equipment and devices integral to the signal.

Existing equipment such as poles, mast arms and foundations cannot be re-used or upgraded and shall be new;

h. Traffic signal at York Street and 47th Avenue with pre-signal interconnect to the UPRR York Street Crossing warning devices shall not be constructed prior to completion of the final stage of the UPRR Crossing track reconstruction work; and

i. The Ultimate configuration shall be accommodated.

11.5.2. Traffic Signal Materials

All traffic signal poles shall be approved by CCD prior to design submittals to the Department. This includes wiring, luminaires, luminaire lengths, luminaire heads, conduit sizes, and all other materials for the signals. All lighting fixtures and signal heads shall be LED.

11.5.3. Existing Traffic Signalization

a. Existing signal operations shall be maintained throughout construction. The Developer shall coordinate the removal of the signal poles with Xcel Energy and CCD; and

b. Xcel Energy is the owner of the signal poles and lighting. CCD is the owner of the remaining equipment. All equipment removed that is owned by CCD shall be delivered within 72 hours to Chris Lillie, Denver Public Works (phone 720-865-4066).

11.5.4. Traffic signals shall be designed and constructed to Local Agency standards.

11.5.5. Railroad At-Grade Crossings and Traffic Signal Interconnect.

a. All at-grade Railroad crossings shall be interconnected as per the MUTCD and Public Utilities Commission requirements. The Railroad preemption signal to traffic signal interconnect shall be coordinated with the appropriate Railroad. This includes temporary and permanent traffic signal installations. The Railroad will approve Railroad preemption signal to traffic signal interconnect design, interconnect plan and testing prior to the signal being turned on or modified in any way in accordance with Schedule 10, Section 10 Railroads. Developer shall provide pedestrian access during Construction Work and shall coordinate with Denver Public Schools to provide a safe and ADA compliant crossing per Schedule 10, Section 2 Maintenance of Traffic.

b. The Developer shall be responsible for Construction Work required to interconnect the traffic signal with the Railroad. The Developer shall coordinate the Construction Work, seek approval for the design and construct and terminate the signal interconnect according to the Railroads and CCD requirements in accordance with Schedule 10, Section 10 Railroads.

11.6. Ramp Meters

11.6.1. Ramp Meter Design

a. Permanent ramp meter signalization design for all entrance ramps affected by the Construction Work shall include traffic signal poles, mast arms, pedestal poles, pole footing/caisson locations and sizes, traffic signal heads, signal head placement and alignment, controller cabinet(s), Advanced Transportation Controllers (ATCs), power disconnect and meter, signal phasing, conduits, pull boxes, in pavement vehicle loop detection for on ramp detection, Microwave Vehicle Radar Detectors (MVRD) for mainline detection, Ethernet communication, and on ramp signal system fiber optic interconnect. Designs for two lane entrance ramps shall include overhead mast arm designs with additional side pole heads for both lanes;

b. Temporary ramp meter and timing plans shall be designed, as necessary; to facilitate traffic flow during re-construction of any existing ramp meters. Noninvasive detection is permitted for temporary installations;

c. New designs shall include ramp meter timing plans for the AM, PM and off peak ramp meters affected by the Construction Work;

d. New permanent ramps shall not be opened until a permanent ramp meter has been installed and connected to the fiber optic backbone and communications is established with the Department;

e. Permanent ramp meter timing plans shall be implemented prior to opening of the ramp;

f. Any loops in the I-70 Mainline can be temporarily replaced with non-invasive detection in order to effectively use the ramp meter;

g. Permanent ramp meters shall be required at I-70 Mainline entrance ramps as follows:

   i. Westbound Washington Street;

   ii. Eastbound Washington Street;

   iii. Westbound Brighton Boulevard;

   iv. Eastbound Brighton Boulevard;

   v. Westbound Vasquez Boulevard;

   vi. Westbound Colorado Boulevard;

   vii. Eastbound Colorado Boulevard;

   viii. Westbound Holly/Dahlia Street;

   ix. Eastbound Holly Street/Monaco Street;

   x. Westbound Quebec Street;

   xi. Eastbound Quebec Street;

   xii. Westbound Havana Street – Reconstruction;

   xiii. Westbound Peoria Street – Reconstruction; and

   xiv. Eastbound Peoria Street – Reconstruction.

h. Existing ramp meter signal operations shall be maintained throughout construction. The Developer shall be responsible for the removal and disposal of existing signal equipment and structures that are to be replaced. The existing Type 170 controllers and serial communication for existing ramp meter locations shall be replaced with ATC's and Ethernet switches. If existing ramp meters are impacted as a part of the Project, new equipment shall be installed. Existing ramp meters, listed below, and any added to temporary configurations need to continue operating with Type 170 controllers and serial communication until a full system switch-over occurs.

   i. Westbound Central Park Boulevard;

   ii. Eastbound Central Park Boulevard; and

   iii. Eastbound Havana Street.

i. Existing and new ramp meters shall be connected to the new CDOT fiber optic backbone and utilize Ethernet switches for communication as described in Schedule 10, Section 3 ITS and Tolling Equipment. If lateral conduit and fiber connections require crossing bridge structures, see Schedule 10, Section 13 Structures;

j. All ramp meters shall be interconnected with a 2 inch conduit and 12 strand single mode fiber optic cable to the local signal cabinet at each ramp termini;

k. All ramp traffic signal poles shall be galvanized. All two lane entrance ramps to I-70 Mainline shall be a two lane ramp metered, with the exception of westbound Vasquez and eastbound Havana on ramps which will be one lane; and

l. Supplemental queue detectors, at mid ramp, shall be added to the entrance ramps at Brighton Blvd. eastbound and Colorado Blvd. eastbound. Supplemental ramp metering

warning signing and beacons shall be added on Brighton Blvd. northbound, Colorado Blvd. northbound, Quebec St. northbound and Peoria St. northbound. Final locations to be Approved by the Department. Schedule 10, Section 11, Appendix A Revision of Section 614 - Microwave Presence Detector shall be applied for ramp metering detection on a bridge structures.

11.7. Lighting

11.7.1. Lighting Design

a. Prior to the issuance of NTP 2, the Developer shall submit an inventory of all existing lighting affected by the Construction Work, in MicroStation format, to the Department for Acceptance. The report shall indicate if each individual light is working or not working during night time conditions. The report shall also include the lighting circuitry within the Site;

b. The Developer shall prepare mid mast median lighting design for the I-70 Mainline between Brighton Boulevard and Chambers Road including the transition into the existing vector lighting from I-25 to Brighton Boulevard, and into the existing high mast interchange lighting at I-225/I-70. New high mast lighting shall not be permitted. If necessary Developer shall provide additional lighting on the I-70 Mainline shoulders to comply with relevant requirements of Schedule 10, Section 11;

c. The Developer shall prepare pedestrian lighting designs on both north and south 46th Ave from Brighton Blvd. to Milwaukee Street, York Street, Local Agency Roadways over I-70 Mainline and the Cover;

d. Lighting design shall include ramps, sidewalks, Local Agency Roadways, highways arterials, parks, pedestrian, bike and take into consideration all existing permanent lighting conditions on roadways impacted by the Construction Work. The design shall cover both temporary and permanent lighting. Details shall include existing topography, ROW, Utilities and drainage facilities, structures, all existing and proposed facilities, location and orientation of standards and fixtures, wiring, conduits, pedestals, power sources, and all other lighting components as required;

e. Permanent lighting shall be designed and constructed to be consistent with current CDOT *M-Standard Plans*, Xcel Energy lighting standards (unless modifications or waivers to the Xcel Energy lighting standards are otherwise approved by Xcel Energy), DPS lighting standards, and CCD lighting standards, as applicable;

f. Existing lighting impacted by the Construction Work shall be replaced to include complete interchange lighting or partial interchange lighting within the Site and Local Agency Roadways;

g. The lighting design submittal shall include lighting calculations for both permanent and temporary conditions. Design details shall include lighting calculations and electrical design including voltage-drop calculations for each circuit to Xcel Energy for approval prior to the installation of the wiring for the connections to the power sources; and

h. New lighting underneath structures shall be placed where a lane closure is not required for maintenance. Existing lighting under structures shall be re-set to a location where a lane closure is not required for maintenance. Both of these requirements for existing and new lighting shall also meet the photometrics regarding design.

11.7.2. Lighting Materials

a. The Developer shall use lighting equipment for all permanent installations as specified in the CDOT *Standard Specifications*, or as specified or otherwise approved by Xcel Energy, DPS, or CCD, as applicable;

b. The Developer shall obtain approval of the lighting equipment from the Local Agency responsible for maintenance; and

c. For areas within incorporated municipal boundaries that Xcel Energy is responsible for maintenance, the Developer shall submit the materials lists for the proposed lighting, including under deck lighting and all associated material for approval by Xcel Energy prior to ordering material. The lighting materials shall also be approved by the CCD.

11.7.3. Existing Lighting

Xcel Energy will remove the existing lighting as required within the Site that is owned by Xcel Energy. The Developer shall be responsible for the coordination of lighting removal and lighting relocation Work to be performed by Xcel Energy. Lighting removal work by Xcel Energy will include all existing lighting on the existing circuitry to be removed, which may require the Developer to provide temporary lighting to maintain minimum lighting levels in accordance with Schedule 10, Section 2.12.7 Temporary Lighting.

11.8. Deliverables

At a minimum, the Developer shall submit the following to the Department for Information, Acceptance, or Approval in accordance with the specified timeframes:

Table 11-2 Deliverables

Deliverable	Information, Acceptance, or Approval	Schedule
Class III, overhead signs, sign structure cross sections, and Tolled Express Lane regulatory and Guide Signs Plan	Acceptance	As part of the preliminary (30% level) plan package, final (100% level) plan package, and prior to RFC documents.
Existing signing and striping inventory	Information	Prior to issuance of NTP 2
Existing lighting inventory	Acceptance	Prior to issuance of NTP 2
Layouts for all special and guide signs	Acceptance	Prior to RFC documents
Temporary and permanent traffic signalization plans	Acceptance	Prior to RFC documents
LOGOS signing location	Approval	Prior to RFC documents
Temporary and Permanent ramp meter plans	Acceptance	As part of the preliminary (30% level) plan package, final (100% level) plan package, and prior to RFC documents.
Permanent lighting plans and temporary lighting plans	Acceptance	As part of the preliminary (30% level) plan package, final (100% level) plan package, and prior to RFC documents.
Temporary and permanent traffic signal and ramp metering timing plans with the associated electronic and software files.	Acceptance	Prior to RFC documents
Lighting design, photometric, lighting materials and electrical design calculations for permanent lighting	Acceptance	Prior to RFC documents
Documentation and Information required for IAR approval	Approval	Prior to RFC documents
Class III, overhead signs, sign structure cross sections, and Tolled Express Lane regulatory and Guide Signs Plan	Acceptance	As part of the preliminary (30% level) plan package, final (100% level) plan package, and prior to RFC documents.
Existing signing, striping and lighting inventory	Acceptance	Prior to issuance of NTP 2
Layouts for all special and guide signs	Acceptance	Prior to RFC documents

11.9. Appendices

Appendix A Project Special Provisions

Appendix A
Project Special Provisions for Signing, Pavement Markings, Signalization and Lighting

The following specifications modify and take precedence over the Standard Specifications. The provisions of Appendix A to Schedule 10A Applicable Standards and Specifications apply to these Project Special Provisions.

PROJECT SPECIAL PROVISIONS

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See Schedule 10 Section 3 Appendix A for the following Project Special Provisions:

Revision of Section 613 – CDOT and CCD Electrical Conductor Identification
Revision of Section 613 – CDOT Electrical Conduit
Revision of Section 614 – Fiber Optic Pre-Connectorized Cable
Revision of Section 614 – Fiber Optic Cable (Single Mode)
Revision of Section 614 – Ethernet Switch (3930
Revision of Section 614 – Coarse Wavelength Division Multiplexing SFP
Revision of Section 614 – Optical Attenuator
Revision of Section 614 – Single Wavelength Course Wavelength Division Multiplexing (CWDM) Optical Filter
Revision of Section 614 – Buffer Tube Fan Out Kit
Revision of Section 614 – Fiber Optic Termination Panel
Revision of Section 614 – ITS Offline Devices
Revision of Section 614 – Grounding and Bonding
Revision of Section 614 – CCD Loose Tube Fiber Optic Cable
Revision of Section 614 – CCD Test Fiber Optic Cable

REVISION OF SECTION 202
CCD REMOVAL OF TRAFFIC SIGNAL EQUIPMENT

Section 202 of the Standard Specification is hereby revised for this project as follows: Subsection 202.03 shall include the following:

The Contractor shall safeguard any salvageable materials designated by City and County of Denver (CCD) Traffic, and shall be responsible for the expense of repairing or replacing damaged or missing material until it is delivered to the CCD Traffic Maintenance Yard at 5440 Roslyn Street, Denver.

Designation of salvageable equipment and times for delivery of such items shall be coordinated with CCD Traffic (contact Chris Lillie at 720-865-4066 or Greg Salazar at 303-591-7146).

Signal operations shall be maintained at each of the Project intersections throughout construction.

Subsection 202.04 shall include the following:

Removal of the traffic signal equipment shall include signal poles (without luminaries), pedestal poles, footings, span wire cable, traffic signal controller and cabinet, pedestrian push button, cabinet footings, all attachment hardware, and all incidental equipment, except as noted on plans. All existing foundations and pull boxes shall be removed and back-filled. All wiring shall be removed from existing conduit and the conduit shall be abandoned in place.

Xcel Energy shall remove all signal poles with luminaries attached. Xcel Energy will remove only the signal pole and luminaries, and the Contractor shall remove the remainder of the traffic signal equipment, as noted in the plans. The Contractor shall coordinate with Xcel Energy for these removals.

All "Light Emitting Diode" (LED) signal lenses in existing signal faces shall be removed prior to the removal of the signal face. These LED lenses shall be protected from damage and delivered to 5440 Roslyn Street, Denver.

Times for delivery to the maintenance yard shall be coordinated with CCD Traffic Engineering Services at 720-865-4000.

REVISION OF SECTION 613
CCD ELECTRICAL CONDUIT– GENERAL

Section 613 of the Standard Specifications is hereby revised for this project as follows:

Add the following to subsection 613.07:

Conduit color shall be a different color than that used for CDOT or Zayo.

Directional boring is the preferred method of conduit installation.

All conduit bends, including factory-installed bends, shall not have a bend radius less than 6 times the inside diameter of the conduit.

The excavations required for the installation of conduit or cable shall be performed in such a manner as to avoid unnecessary damage to streets, sidewalks, landscaping, sprinkler systems and other improvements. Trenches shall not be excavated wider than necessary for the installation of the electrical appurtenances. Excavation shall not be performed until immediately before installation of conduits. The material from the excavation shall be placed in a position not to cause damage or obstruction to vehicular or pedestrian traffic or interfere with surface drainage.

Trenches shall be made with a rock-wheel or other machine capable of cutting a narrow trench (4 inch) so as to allow traffic to pass over prior to back filling. The machine shall be equipped with shields to direct the spoil downward and away from passing vehicles, workmen and pedestrians.

Off-street trenches shall be back-filled with the same material that was removed and shall be compacted and shaped to match the surrounding surface. On-street trenches within all roadway areas shall be back-filled with CDOT approved Structure Backfill (Flow-Fill) and capped with 9 inch minimum of Hot Mix Asphalt Pavement (Patching) in accordance with Section 403 and City and County of Denver Street Cut Regulations if applicable. If surrounding pavement depth is greater than 9 inches, the HMA (Patching) depth shall match the existing pavement. Patching work to be Accepted by the Department.

All surface materials including sprinkler systems, landscaping, shrubs, sod grass, and native growth vegetation which is disturbed by trenching and back-filling operation shall be restored in kind equal to or exceeding the original conditions.

All conduit runs that will not have a copper conductor installed shall have a No. 14 AWG stranded copper conductor placed inside for locating purposes. Locating conductor and tape shall be included with the work.

Conduit shall always enter a pull box, hand-hole, or any other type structure from the direction of the run only.

All conduit shall be fully compatible with fiber optic cable. Plastic conduit shall be Schedule 80 in the diameters shown on the plans. Each conduit shall be equipped with a pull tape and each bore shall have a copper tracer wire of at least No. 14 AWG.

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REVISION OF SECTION 613
CCD ELECTRICAL CONDUIT – GENERAL

Each conduit with a length greater than 400 feet between pull boxes, shall be equipped with a pull tape. The pull tape shall have a minimum tensile strength of 1250 lbs. and be of a design and manufacture that prevents cutting or burning into the conduit during cable installation.

Plastic PVC conduit shall be certified by the manufacturer as meeting ANSI/UL 6 and 651. The manufacturer shall be ISO 9000 compliant.

If the Contractor is unable to jack or bore the conduit at the lengths shown on the plans from pull box to pull box, all splice couplings and associated work to splice the conduit shall be included with the work. This shall include excavation down to the required depth of conduit at the splice location. All landscape repairs will be required after excavation of conduit at all splice locations. All splice couplings shall be water and air tight and installed at a depth to match the remaining run of conduit. No elevation difference will be allowed. Splices shall be kept to a minimum and all locations shall be Approved by the Department. Additional pull boxes shall not be substituted for splices.

Conduit plugs for sealing conduit shall also be supplied and installed in all open conduit ends as soon as the conduit is installed. Plugs shall be durable, fabricated from no metallic parts, be of the split design to allow removal and reinstallation around in-place cables and be easily removable and reusable. Plugs shall be capable of being installed by hand without any tools and shall provide a water and air tight seal of at least 100 psi and shall cause no damage to the cable when installed.

There may be locations, as shown on the plans, specifications or as directed by the Department, which may require new conduit to be installed into existing pull boxes. The Contractor shall excavate around the pull box, without damaging the existing pull box, and install the new conduit per the requirements of this Special Provision. If the existing pull boxes or concrete collars are cracked or damaged during conduit installation, the Contractor shall be required to replace either or both per the CCD standards, at no expense to the Department or CCD.

Subsection 613.10 shall include the following:

Electrical conduit shall be installed in accordance with these Special Provisions, the Project Standards or as directed by CCD. Electrical conduit will include groundwork, sweeps, pull cord, copper tracer wire, adapters, fittings, splice couplings, conduit plugs (for conduits both with and without fiber optic cable), equipment, labor, and all other items necessary to complete the work.

REVISION OF SECTION 613
CCD PULL BOXES – GENERAL

Section 613 of the Standard Specifications is hereby revised for this project as follows:

Subsection 613.07 shall include the following:

All Type A, Type B and Type C pull boxes shall conform to the minimum inside dimensions specified in the City and County of Denver (CCD) Traffic Signal Standards (Drawing 16.1.7). The cover shall be attached to the pull box body by means of screw-in bolts and shall have two lift slots to aid in the removal of the lid. Non-standard bolts shall not be used

Pull boxes Type A and Type B shall be used in all signal conduit installation. The pull box shall have a detachable cover with a skid-resistant surface and have the words "TRAFFIC" or, "ELECTRIC" cast into the surface. Painting the words shall not be accepted.

All traffic communication pull boxes shall have the words "TRAFFIC COMM" physically impressed (not painted) on its top. The interconnect pull boxes or Pull Box (Special) shall be the Type C pull box.

When the plans call for a fiber optic cable location marker to be installed at the pull box location, the concrete foundation support for the location marker shall be placed monolithically with the concrete collar.

All concrete collars, footings, and location marker supports shall be Portland Cement Concrete Class B and shall be in accordance with Section 601.

Pull boxes that are to be in traveled ways shall be outfitted with traffic bearing lids rated for HS 20-44 loads. The pull boxes shall have a special concrete footing extending 8 inches around the outside and 6 inches around the inside of the pull box bottom, as shown in the plans. Pull boxes installed in dirt or landscape areas shall have a 12 inch wide by 6 inch thick concrete collar placed around the top in lieu of the concrete footing, as shown in the plans.

Pull Box, that are surface mounted, shall be metal type with a hinged front door and have at least a NEMA 3R rating. The hinged door shall be provided with both a weather tight seal and a key lock mechanism. Surface mounted pull boxes shall be of the dimensions shown in the plans, and shall be mounted on or embedded into hard surfaces such as bridge decks, concrete barriers, retaining walls, or buildings, as shown on the plans. Surface mounted pull boxes shall be attached using 3/8-inch epoxy anchors or other methods, as Approved by the Department. Surface mounted pull boxes shall not be used for ground installations.

REVISION OF SECTION 614
CCD LED PEDESTRIAN SIGNAL HEAD (COUNTDOWN)

Section 614 of the Standard Specifications is hereby revised for this project as follows: Subsection 614.01 shall include the following:

This work includes the installation of Light Emitting Diode (LED) Pedestrian Signal Faces with countdown timers as shown in the Contract.

Subsection 614.08 (h) shall include the following:

Pedestrian signal faces with countdown timers shall meet the following requirements:

The dimensions of the signal housing and the LED symbols, as well as moisture and dust resistance requirements shall be in accordance with the current ITE PTCSI Standards.

Signal housing shall be aluminum, painted per CCD standards Federal Green and "clam-shell" mounted. The signal shall have user-selectable modes for countdown for walk cycle only, pedestrian cycle only, or both walk and pedestrian clearance.

The countdown module shall have an internal conflict monitor to prevent any possible conflicts between the Hand/Person signal indications and the time display. The display shall not countdown during a Solid Hand indication.

LED symbols shall be solid icons and shall provide uniform light dispersion such that the "pixel" effect is minimized. Lettered or outline symbol styles will not be permitted. The Man/Hand configuration shall provide clear and distinct lamination where either symbol is in use.

The LED module shall be rated for use in an ambient operating temperature range of -40° F to 165° F.

The signal shall meet NEMA Standard TS2 for voltage surge protection, and shall have an automatic reset in case of a power outage.

REVISION OF SECTION OF 614
CCD TRAFFIC CONTROL DEVICES

Section 614 of the Standard Specification is hereby revised for this project as follows: Subsection 614.08 (h) shall include the following:

Light Emitting Diode (LED) signal lenses shall be installed in all Red, Yellow, Green, Walk and Don't Walk, and Countdown signal displays.

The LED signal lenses for the 12" and 8" circular balls and 12" circular arrows are hereby added to the Standard Specifications and Contractor shall comply with the following specifications:

Manufacturer Requirements and Approvals:

The manufacturer supplying product to this specification shall have a minimum of 13 years of experience in the manufacture of Light Emitting Diode (LED) Traffic Signals with High Flux LEDs used in the North American market.

Manufacturers supplying products to this specification must be a registered participant of the Traffic Signal Modules Certification Program. Manufacturers shall have the unique long life module part numbers being provided certified and listed on the Intertek-ETL LED Traffic Signal Modules Certification Program approved products website prior to ordering equipment.

Manufacturers supplying products to this specification shall manufacture and assemble product on an Intertek-ETL audited line located in the USA. Unique part number shall be listed on manufacturers label proving difference between standard modules and long life modules.

If requested, documentation shall be provided by manufacturer demonstrating the changes made to their standard product that allows for ITE specification compliance over 15 year warranty period.

Physical & Mechanical Requirements:

General
Tinted or Non-Tinted Lens. Unless designated lens color shall be tinted with a color as required in paragraph 4.2 of the ITE specification. The products shall be available with non-tinted lenses as an option.

The LED module shall utilize high flux LEDs rated at 1 watt or higher and have an incandescent, non-pixilated appearance when illuminated. The use of low power LEDs, for example 5 mm LEDs, is not permissible in the design and production of long life arrow products.

The external lens shall have a smooth outer surface to prevent buildup of dirt/dust and shall be designed to minimize the potential for sun phantom signals.

All LEDs utilized to illuminate circular signal modules, shall be LEDs that have been manufactured utilizing materials that have industry acceptance as being suitable for uses in outdoor applications. At no time is the use of LEDs that utilize AlGaAs technology acceptable.

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REVISION OF SECTION 614
CCD TRAFFIC CONTROL DEVICES

All plastic components shall be molded and assembled in the USA. This includes: back housing, spreading lens and front lens. Certificate of manufacturing location must be available and supplied at time of ordering.

All lenses shall be hard coated in the USA. Certificate of manufacturing location must be available and supplied at time of bid requested. All reflectors shall be metalized in the USA. Certificate of manufacturing location must be available and supplied at time of ordering.

Module Identification
In addition to the required ITE labeling all modules must be labeled with the Intertek-ETL Verified label shown in CCD standards. This label designates the compliance and listing with the Intertek-ETL Traffic Signal Certification Program.

Electrical:

General
The following color scheme shall be used for all modules AC power leads: White for Common, Red for the Red ball signal, Yellow for the Yellow ball signal, and Brown for the Green ball signal.

The AC power leads shall exit the module via a rubber grommetted strain relief, and shall be terminated with insulated female quick connect terminals with spade/tab adapters. The leads shall be separate at the point at which they leave the module.

All external wiring utilized in the LED traffic signal module shall be anti-capillary type wire to prevent the wicking of moisture to the interior of the module.

LED module and power supply shall be design to remain ITE compliant over a 15 year life.

To minimize the temperature exposure of the power supply all power supplies should be located at the bottom of the module when the arrow is facing left.

For additional protection from moisture, all power supplies shall be conformal coated for additional protection.

Certified products listing at the time or ordering materials. Upon request, the supplier must provide a copy of the listing in the pre-ordering package.

Transient Voltage Protection
In addition to the transient test requirements defined in the Design Qualification Testing section of ITE Vehicle Traffic Control Signal Heads (VTCSH) specification, all power supplies used in the circular signals supplied to this specification shall be capable of passing an additional ring-wave surge testing in accordance with the IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000V and less) AC Power circuits, ANSI/IEEE C62.41.2-2002, 6KV, 100 kHz ring-wave with an output impedance of 30 ohms. The short circuit current shall be 200 Amps.

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REVISION OF SECTION 614
CCD TRAFFIC CONTROL DEVICES

Power
Typical wattages at 25 o C for the 12" circular arrow LED traffic Signal Modules shall be: Red - 8 watts, Yellow - 13 watts, and Green - 8 watts.

Typical wattages at 25o C for the 12" circular ball LED traffic Signal Modules shall be: Red – 7 watts, Yellow - 11 watts, and Green - 7 watts. Typical wattages at 25o C for the 8" circular ball LED traffic Signal Modules shall not exceed: Red - 8 watts, Yellow - 10 watts, and Green 8 watts.

Upon Request, the supplier must provide an Intertek-ETL test report for the base model being supplied to this specification.

The base products must be listed in the Intertek Directory of LED Traffic Signal Modules

Warranty Requirements:

Manufacturers shall provide a detailed written warranty issued by the factory of module origin with the following minimum provisions:

Modules shall, at the manufacturer's option, be repaired or replaced if the module fails to function as intended due to workmanship or material defects within the first 15 years from the date of delivery.

Modules shall, at the manufacturer's option, be repaired or replaced if the module exhibit luminous intensities less than the minimum specified values within the first 15 years of the date of delivery.

Upon request, the LED lamp module manufacturer shall provide written documentation of its ability to satisfy a worst-case, catastrophic warranty claim.

A current corporate annual report duly-certified by an independent auditing firm, containing financial statements illustrating sufficient cash-on-hand and net worth to satisfy a worst case, catastrophic warranty claim is an example of suitable documentation.

The documentation shall clearly disclose:

The country in which the factory of module origin is located

The name of the company or organization that owns the factory of module origin including any and all of its parent companies and/or organizations, and their respective country of corporate citizenship

For firms with business and/or corporate citizenship in the USA of less than fifteen years, the process by which the end-users/owners of the modules will be able to obtain worst-case, catastrophic warranty service in the event of bankruptcy or cessation of operations by the firm supplying the modules within North America, or in the event of bankruptcy or cessation-of-operations by the owner of the factory of origin, shall be clearly disclosed.

REVISION OF SECTION 614
CCD TRAFFIC SIGNAL CONTROLLER CABINET

Section 614 of the Standard Specifications is hereby revised for this project as follows: Subsection 614.01 shall include the following:

This work shall consist of furnishing and installing a new P-type Traffic Controller Cabinet and complete installation of the Traffic Signal Controller Cabinet assembly, malfunction management units (MMU), vehicle detector amplifiers, uninterrupted power supply (UPS), other ancillary hardware, and traffic signal cabinet base per City and County of Denver (CCD) standards.

Delete Subsection 614.08 (c) and replace with the following:

All new cabinets are the P-type cabinets as per the CCD Traffic Standards. Each cabinet shall be installed on a newly installed traffic signal controller cabinet base unless otherwise specified on the plan. Contact Chris Lillie at 720-865-0466 for cabinet assembly requirements and all other necessary auxiliary hardware.

Controller cabinet assemblies shall include an integrated uninterrupted power supply (UPS) units that comply with CCD standards (see CCD Double Conversion Uninterrupted Power Supply System Project Special Provision).

Subsection 614.10 shall include the following:

The Contractor shall demonstrate successful traffic signal operations at all new controller and cabinet locations to the satisfaction of CCD or the Department's designee prior to acceptance of this item. The Contractor shall contact CCD or the Department's designee 3 days before turning on signal. Work shall include all required programming of controllers and establishing or re- establishing all required wiring connections. Phasing and timing information at each location shall be furnished to the Contractor by CCD. Contractor shall allow CCD 30 working day notification prior to needing phasing and timing information.

All new wiring shall conform to CCD and International Municipal Signal Association (IMSA) specifications.

Subsection 614.13 shall include the following:

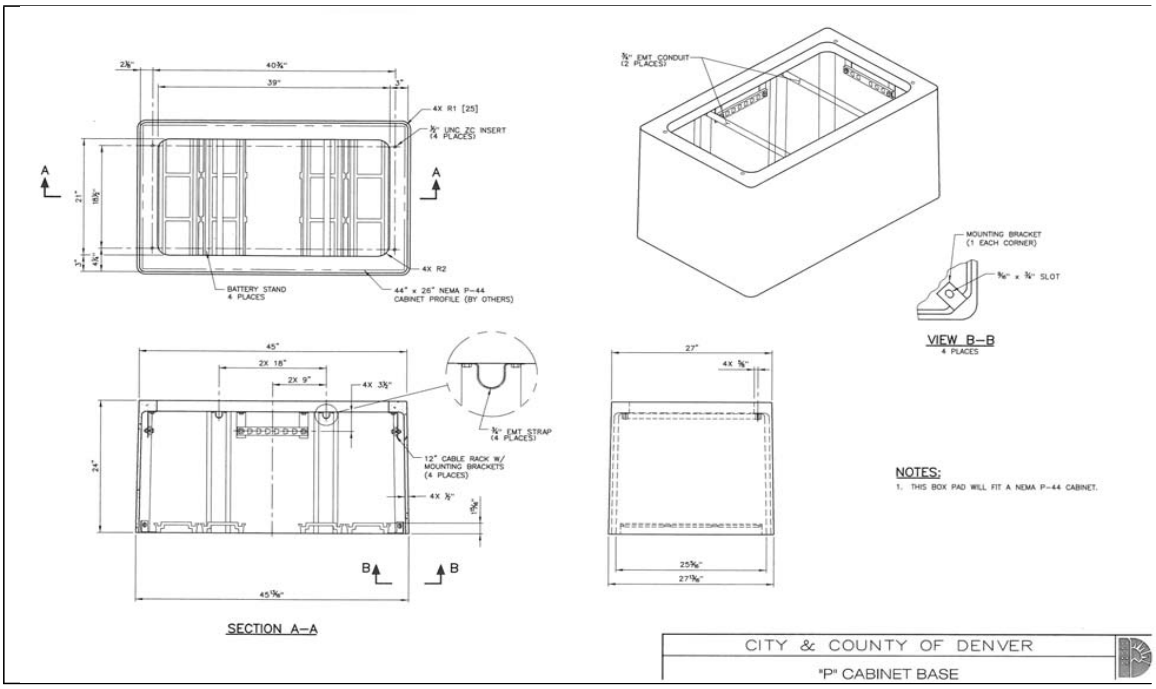
The installation of traffic signal controllers cabinets shall include all labor, materials, ancillary hardware, traffic signal cabinet base, wiring and wiring re-connection (including Xcel Energy power feed) required to provide successful operation of the item.

REVISION OF SECTION 614
CCD TRAFFIC SIGNAL CABINET BASE

Section 614 of the Standard Specifications is hereby revised for this project as follows:

Subsection 614.01 shall include the following:

This work consists of furnishing and installing a polymer concrete Traffic Signal Controller Cabinet Base as shown on the plans and in accordance with the CCD standards. The base shall fit the City and County of Denver's P-Type Traffic Signal Controller Cabinet. Dimensions of the base are shown in the following drawing.



Subsection 614.10 shall include the following:

Prior to starting cabinet base installation, the Contractor shall obtain field verification of the location of the base from the CCD or the Department's designee.

Cabinet base installation shall include all labor and materials to completely install a new P-type cabinet base for the controller cabinet as specified in the plans. This is to include all conduit installation and modification work, back-filling, and repair to all surrounding surface/area.

REVISION OF SECTION OF 614
CCD PEDESTRIAN PUSH BUTTON AND INSTRUCTION SIGN

Section 614 of the Standard Specification is hereby revised for this project as follows:

Subsection 614.08 (f) shall include the following:

1. Push button assemblies shall be of the direct push button solid state contact type and shall not have any levers, handles or toggle switches externally or internally. The pushbutton shall be of tamperproof and all weather construction. The pushbutton shall have a protective shroud that is an integral part of the cover and it shall encircle the pushbutton actuator to deter vandalism. The assembly shall be made weatherproof and shockproof by means of synthetic rubber gaskets between the cover and the enclosure and between the plunger and the cover so that it shall be impossible to receive an electrical shock under any weather conditions. The front cover plate shall be secured with stainless steel vandal resistant screws. The push button shall operate on logic ground.

2. The solid state switch shall be entirely insulated from the housing and operating button. The pushbutton shall consist of a 2 inch 303 stainless steel metal plunger and an oil and gasoline resistant Piezo driven solid state switch, all encased in a high impact thermoplastic enclosure with 4 stainless steel mounting screws. The solid state switch shall be normally open and shall be closed with a minimum of pressure on the button (3lb ± 1lb), restoring immediately to the normally open position when the pressure is released.

The aluminum housing shall be the flat back frame type with adjustable mounting staves that will readily enable it to be mounted on any size traffic signal pole or push button standard. The housing shall have a ½ inch access hole in the rear for wiring. The housing shall have a bottom threaded conduit entrance hole and shall be provided with a threaded plug so that access is only possible from the rear of the housing. The plug shall not be removable with ordinary tools. The housing shall be painted Dark Olive/Federal Green baked enamel matching to Federal Standard 595A color #14056.

The frame shall have a cast aluminum attachment to allow the mounting of a 9" X 12" pedestrian instruction sign. By removal of 4 screws the frame shall convert to allow the mounting of a 5" X 7 ¾" pedestrian instruction sign.

Pedestrian Instruction Sign.

1. Pedestrian instruction signs shall conform to the latest version of the Manual of Uniform Traffic Control Devices, published by the U.S. Department of Transportation Federal Highway Administration.

2. Pedestrian instruction signs shall be Type R10-3a, Type R10-3b, Type R10-3c, R10-3d, and R10-3e as specified in the contract documents (or bid documents).

Pedestrian instruction signs shall be constructed in accordance with the applicable provisions of the current CCD Standard Specifications. Pedestrian instruction sign need not be reflectorized.

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REVISION OF SECTION OF 614
CCD PEDESTRIAN PUSH BUTTON AND INSTRUCTION SIGN

The sign shall be fabricated with 0.063 aluminum. The signs shall be mounted using four 5/16" mounting holes 4" X 6 ¾" for the 5" X 7 ¾" sign and 7" X 10" for the 9" x 12" sign. The pedestrian instruction signs shall have rounded corners ¾" radius for the 5" X 7 ¾" sign and 1 ½" radius for the 9" X 12" sign.

REVISION OF SECTION 614
CCD INTERSECTION DETECTION SYSTEM (CAMERA)

Section 614 of the Standard Specifications is hereby revised for this project as follows: Subsection 614.01 shall include the following:

This work consists of furnishing and installing a fully-functional video detection system at the intersection as specified on the plans.

Subsection 614.08 shall include the following:

System Hardware:

The machine vision system hardware shall consist of three components: 1) a color, 22x zoom, MVP sensor; 2) a modular cabinet interface unit; 3) a communication interface panel. Additionally, an optional personal computer (PC), based on CCD requirements, shall host the server and client applications that are used to program and monitor the system components. The real-time performance shall be observed by viewing the video output from the sensor with overlaid flashing detectors to indicate the current detection state (on/off). The MVP sensor shall optionally store cumulative traffic statistics internally in non-volatile memory for later retrieval and analysis.

The MVP shall communicate to the modular cabinet interface unit via the communications interface panel and the software applications using the industry standard TCP/IP network protocol. The MVP shall have a built-in, Ethernet-ready, Internet Protocol (IP) address and shall be addressable with no plug in devices or converters required. The MVP shall provide standard MPEG-4 streaming digital video. Achievable frame rates shall vary from 5 to 30 frames/sec as a function of video quality and available bandwidth.

The modular cabinet interface unit shall communicate directly with up to 8 MVP sensors and shall comply with the form factor and electrical characteristics to plug directly into a NEMA type C or D detector rack providing up to 32 inputs and 64 outputs or a 170 input file rack providing up to 16 contact closure inputs and 24 contact closure outputs to a traffic signal controller.

The communication interface panel shall provide 4 sets of 3 electrical terminations for three-wire power cables for up to 8 MVP sensors that may be mounted on a pole or mast arm with a traffic signal cabinet or junction box. The communication interface panel shall provide high-energy transient protection to electrically protect the modular cabinet interface unit and connected MVP sensors. The communications interface panel shall provide single-point Ethernet connectivity via RJ45 connector for communication to and between the modular cabinet interface module and the MVP sensors.

System Software:

The MVP sensor embedded software shall incorporate multiple applications that perform a variety of diagnostic, installation, fault tolerant operations, data communications, digital video streaming, and vehicle detection processing. The detection shall be reliable, consistent, and perform under all weather, lighting, and traffic congestion levels. An embedded web server shall permit standard internet browsers to connect and perform basic configuration, maintenance, and video streaming services.

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There shall be a suite of client applications that reside on the host client / server PC. The applications shall execute under Microsoft Windows XP or 7. Available client applications shall include:

Master network browser: Learn a network of connected modular cabinet interface units and MVP sensors, display basic information, and launch applications software to perform operations within that system of sensors.

Configuration setup: Create and modify detector configurations to be executed on the MVP sensor and the modular cabinet interface unit.

Operation log: Retrieve, display, and save field hardware run-time operation logs of special events that have occurred.

Software install: Reconfigure one or more MVP sensors with a newer release of embedded system software.

Streaming video player: Play and record streaming video with flashing detector overlay.

Data retrieval: Fetch once or poll for traffic data and alarms and store on PC storage media.

Communications server: Provide fault-tolerant, real-time TCP/IP communications to / from all devices and client applications with full logging capability for systems integration.

MVP Sensor:

The MVP sensor shall be an integrated imaging color CCD array with zoom lens optics, high- speed, dual-core image processing hardware bundled into a sealed enclosure. The CCD array shall be directly controlled by the dual-core processor, thus providing high-quality video for detection that has virtually no noise to degrade detection performance. It shall be possible to zoom the lens as required for setup and operation. It shall provide JPEG video compression as well as standard MPEG-4 digital streaming video with flashing detector overlay. The MVP shall provide direct real-time iris and shutter speed control. The MVP image sensor shall be equipped with an integrated 22x zoom lens that can be changed using either configuration computer software. The digital streaming video output and all data communications shall be transmitted over the three-wire power cable.

Power: The MVP sensor shall operate on 110/220 VAC, 50/60Hz at a maximum of 25 watts. The camera and processor electronics shall consume a maximum of 10 watts and the remaining 15 watts shall support an enclosure heater.

Detection Zone Programming: Placement of detection zones shall be by means of a PC with a Windows XP or 7 operating system, a keyboard, and a mouse. The PC monitor shall be able to show the detection zones superimposed on images of traffic scenes.

The detection zones shall be created by using a mouse to draw detection zones on the PC monitor. Using the mouse and keyboard it shall be possible to place, size, and orient detection zones to provide optimal road coverage for vehicle detection. It shall be possible to download detector configurations from the PC to the MVP sensor and cabinet interface module, to retrieve the detector configuration that

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is currently running in the MVP sensor, and to back up detector configurations by saving them to the PC fixed disks or other removable storage media.

The supervisor computer's mouse and keyboard shall be used to edit previously defined detector configurations to permit adjustment of the detection zone size and placement, to add detectors for additional traffic applications, or to reprogram the MVP sensor for different traffic applications or changes in installation site geometry or traffic rerouting.

Optimal Detection: The video detection system shall optimally detect vehicle passage and presence when the MVP sensor is mounted 30 feet (10 m) or higher above the roadway, when the image sensor is adjacent to the desired coverage area, and when the distance to the farthest detection zone locations are not greater than ten (10) times the mounting height of the MVP. The recommended deployment geometry for optimal detection also requires that there be an unobstructed view of each traveled lane where detection is required. Although optimal detection may be obtained when the MVP is mounted directly above the traveled lanes, the MVP shall not be required to be directly over the roadway. The MVP shall be able to view either approaching or receding traffic or both in the same field of view. The preferred MVP sensor orientation shall be to view approaching traffic since there are more high contrast features on vehicles as viewed from the front rather than the rear. The MVP sensor placed at a mounting height that minimizes vehicle image occlusion shall be able to simultaneously monitor a maximum of six (6) traffic lanes when mounted at the road-side or up to eight (8) traffic lanes when mounted in the center with (4) four lanes on each side.

Count Detection Performance: Using an installed camera that meets the optimal viewing specifications described above for count station traffic applications, the system will be able to accurately count vehicles with at least 98% accuracy under normal operating conditions (day and night), and at least 93% accuracy under artifact conditions.

Artifact conditions are combinations of weather and lighting conditions that result from shadows, fog, rain, snow, etc. The volume count will be accumulated for the entire roadway (all traveled lanes), and accumulated over time intervals that contain a minimum of one hundred (100) vehicles to ensure statistical significance.

Demand Presence Detection Performance: Using an installed camera that meets the optimal viewing specifications described above for intersection control traffic applications, the system will be able to accurately provide demand presence detection.

The demand presence accuracy will be based on the ability to enable a protected turning movement on an intersection stop line, when a demand exists. The probability of not detecting a vehicle for demand presence will be less than 1% error under all operating conditions. In the presence of artifact conditions, the MVP will minimize extraneous (false) protected movement calls to less than 7%.

To ensure statistical significance, the demand presence accuracy and error will be calculated over time intervals that contain a minimum of one hundred, protected turning movements.

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These performance specifications will be achieved with a minimum of 2 presence detectors coupled with a single detector function (Type-9) to provide adequate road coverage to sample the random arrival pattern of vehicles at the stop line.

The calculation of the demand presence error will not include turning movements where vehicles do not pass through the presence detectors, or where they stop short or stop beyond the combined detection zones.

Speed Detection Performance: The MVP will accurately measure average (arithmetic mean) speed of multiple vehicles with more than 97% accuracy under all operating conditions for approaching and receding traffic.

The average speed measurement will include a minimum of 100 vehicles in the sample to ensure statistical significance. Optimal speed detection performance requires the camera location to follow the specifications described above for count station traffic applications with the exception that the camera must be higher than 13 m (40) feet.

The MVP will accurately measure individual vehicle speeds with more than 94% accuracy under all operating conditions for vehicles approaching the camera (viewing the front end of vehicles), and more than 90% accuracy for vehicles receding from the camera (viewing the rear end of vehicles).

These specifications will apply to vehicles that travel through both the count and speed detector pair and will not include partial detection situations created by lane-changing maneuvers.

To ensure statistical significance, the average speed accuracy and error will be calculated over time intervals that contain a minimum of one hundred vehicles.

Using a MVP sensor installed within the optimal viewing specifications described above or count station traffic applications

Modular Cabinet Interface Unit:

The modular cabinet interface unit shall provide the hardware and software means for up to eight (8) MVP sensors to communicate real-time detection states and alarms to a local traffic signal controller. It shall comply with the electrical and protocol specifications of the detector rack standards. The card shall have 1500 Vrms isolation between rack logic ground and street wiring.

The modular cabinet interface unit shall be a simple interface card that plugs directly into a 170 input file rack or a NEMA type C or D detector rack. The modular cabinet interface unit shall occupy only 2 slots of the detector rack. The modular cabinet interface unit shall accept up to sixteen (16) phase inputs and shall provide up to twenty-four (24) detector outputs.

Communications Interface Panel:

The communications interface panel shall support up to eight MVPs. The communications interface panel shall accept 110/220 VAC, 50/60 Hz power and provide predefined wire termination blocks for MVP power connections, a Broadband-over-Power-Line (BPL) transceiver to support up to 10MB/s

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interdevice communications, electrical surge protectors to isolate the modular cabinet interface unit and MVP sensors, and an interface connector to cable directly to the modular cabinet interface unit.

The interface panel shall provide power for up to eight (8) MVP sensors, taking local line voltage 110/220 VAC, 50/60 Hz and producing 110/220 VAC, 50/60 Hz, at about 30 watts to each MVP sensor. Two ½-amp SLO-BLO fuses shall protect the communications interface panel.

System Installation & Training:

The supplier of the video detection system shall supervise the installation and testing of the video detection system and computer equipment as required CCD. Training shall be available to personnel of CCD in the operation, set up, and maintenance of the video detection system. The MVP sensor and its support hardware / software is a sophisticated leading-edge technology system. Proper instruction from certified instructors shall be required to ensure that the end user has complete competency in system operation. The User's Guide is not an adequate substitute for practical classroom training and formal certification.

Warranty, Service, & Support:

For a minimum of 3 years, the supplier shall warrant the video detection system. An option for additional year(s) warranty for up to 6 years shall be available. Ongoing software support by the supplier shall include software updates of the MVP sensor, modular cabinet interface unit, and supervisor computer applications.

These updates shall be provided free of charge during the warranty period. The supplier shall maintain a program for technical support and software updates following expiration of the warranty period. This program shall be available to CCD in the form of a separate agreement for continuing support.

Subsection 614.13 shall include the following:

The item shall include all labor, materials, ancillary hardware, training and warranty required to provide a fully-functional system to the satisfaction of the Department.

REVISION OF SECTION 614
CCD EMERGENCY VEHICLE TRAFFIC SIGNAL PRIORITY CONTROL SYSTEM

Section 614 of the Standard Specifications is hereby revised for this project as follows: Subsection 614.08 shall include the following:

System Description:

The emergency vehicle traffic signal priority control system shall enable designated vehicles to remotely cause the traffic signal controller to advance to and/or hold a desired traffic signal display by using existing controller functions. The control shall be activated at a minimum distance of 548.6M (1,800 feet) along an unobstructed "line of sight" path. The control shall not terminate until the vehicle is within 12.2M (40 feet) of the detector or at the intersection.

The system shall consist of the following components:

(a) Vehicle emitter which shall be mounted on the emergency vehicle and shall transmit optical energy signals only in the forward direction. If the municipality presently uses optical pre-emption, the emitters shall be of the same manufacture currently used by the City and County of Denver (CCD) Fire Department.

(b) Phase Selector (minimum 2 channels) which shall cause the signal controller to advance to and/or hold the desired traffic signal display for the emergency vehicle. A pre-emption system chassis shall house two phase selectors.

(c) Optical detector which shall be mounted on or near a traffic signal and shall receive the optical energy signals generated by the vehicle emitter.

1. Detector (Type A), 1 Direction, 1 Channel

2. Detector (Type B), 2 Direction, 1 Channel

3. Detector (Type C), 2 Direction, 2 Channel

(d) Detector Cable (Optical).

System Operations:

(a) The operating sequence shall be initiated when the optical detector receives the required optical energy signal from the Emitter.

(b) The phase selector shall cause the traffic signal controller to advance to and/or hold the desired traffic signal display for the emergency vehicle.

(c) The phase selector shall cause the controller to advance to and/or hold the desired traffic signal display even if the optical energy signals cease before the desired display is obtained.

(d) The phase selector shall allow the traffic signal controller to resume normal operation within ten seconds after optical energy signals cease if the optical energy signals cease after the desired traffic signal display is obtained.

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(e) The phase selector shall not respond to optical energy signals from an emergency vehicle if it is already processing optical energy signals from another emergency vehicle.

System Components:

(a) Vehicle Emitter.

The emitter assembly consists of an emitter and power supply and an emitter control switch assembly. The emitter assembly is mounted on a vehicle and produces a flashing optical signal when in operation. The following shall apply to the vehicle emitter:

1. Shall operate on ten to fifteen volts DC input voltage, but shall not be damaged by input voltage surges up to twenty-five volts DC.
2. Shall be controlled by a single on/off switch that requires no other adjustments by the operator. The on/off condition shall be indicated by a light located adjacent to the switch.
3. Shall be automatically disabled or de-activated by one or a combination of the following: seat switch, emergency brake switch, door switch, and transmission safety switch.
4. Shall operate over an ambient temperature range of minus 34O C to plus 60O C. (minus 30O F. to plus 140O F.)
5. Shall operate in 0 to 95 % humidity.
6. Shall be a pulsed optical energy source with a controlled repetition rate.
7. Shall not generate voltage transients on the battery input line which exceed battery voltage by more than four volts.
8. Shall produce optical energy in a cone of not more than 90 degrees horizontal and not more than 30 degrees vertical. The detectors and/or phase selector shall not sense a pre-emption signal from an emitter outside this cone.

(b) Optical Detector.

The optical detector receives the high intensity optical pulses produced by the emitter. These optical energy pulses are transformed by the detector into appropriate electrical signals which are transmitted to the phase selector. The optical detector is mounted at or near the intersection in a location which permits an unobstructed line of sight to vehicular approaches. The units may be mounted on signal span wires, mast arms or other appropriate structures. The following shall apply to the optical detector:

1. Shall produce optical energy in a cone of not more than 90 degrees horizontal and not more than 30 degrees vertical. The detectors and/or phase selector shall not sense a pre-emption signal from an emitter outside this cone.

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CCD EMERGENCY VEHICLE TRAFFIC SIGNAL PRIORITY CONTROL SYSTEM

2. Shall be of solid state construction.

3. Shall operate over an ambient temperature range of minus 34O C to plus 60O C. (minus 30O F. to plus 140O F.)

4. Shall have internal circuitry potted in a semi-flexible compound to ensure moisture resistance.

5. Shall operate in 0 to 95 % humidity.

6. Shall have a cone of detection of not more than 13 degrees. The detector and/or phase selector shall not sense a pre-emption signal from an emitter outside this cone.

(c) Phase Selector.

The phase selector supplies power to and receives electrical signals from the optical detector. When detector signals are recognized as a valid call, the phase selector causes the signal controller to advance to and/or hold the desired traffic signal display. This is accomplished by activating the pre-empt input to the controller.

The phase selector is capable of assigning priority traffic movement to one of two channels on a first-come, first-serve basis. Each channel is connected to select a particular traffic movement from those normally available within the controller. Once a call is recognized, "commit to green" circuitry in the phase selector functions so that the desired green indication will be obtained even if optical communication is lost. After serving a priority traffic demand, the phase selector will release the controller to follow normal sequence operation. The following shall apply to the phase selector:

1. Shall include an internal power supply to supply power to the optical detectors.

2. Shall have minimum two-channel operation with the capability of interfacing with an additional phase selector for expansion of channels of operation.

3. Shall have adjustable detector range controls for each channel of operation, from 12M (40 feet) to 548M (1800 feet).

4. Shall have solid state indicator lights for power on and channel called.

5. Shall operate over an ambient temperature range of minus 34O C to plus 60O C (minus 30O F. to plus 140O F.)

6. Shall operate in 0 to 95 % humidity.

(d) Detector Cable (Optical).

The following shall apply to the detector cable:

1. 3-Conductor cable with shield and ground wire.

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2. AWG #20 (7x28) stranded.
3. Individually tinned copper strands.
4. Conductor insulation: 600 volt, 75 deg. C (167O F.).
5. 1 Conductor-yellow; 1 Conductor-blue; 1 Conductor-orange.
6. Aluminized mylar shield tape or equivalent.
7. AWG #20 (7x28) stranded uninsulated drain wire
8. DC resistance not to exceed 11.0 ohms per 305M (1000 feet).
9. Capacitance from one conductor to other two conductors and shield not to exceed 157pf/M (48pf /ft.).
10. Jacket: 600 volts, 80 deg. C (176O F.), minimum average wall thickness -1.14mm (.045").
    i. Finished O.D.: 7.62mm (0.3") max.

System Interface:

System shall be capable of operating in a computerized traffic management system when appropriate interfacing is provided by the computer supplier.

General:

The Contractor shall furnish the manufacturer the phasing diagrams indicating controller sequence and timing.

The Contractor shall secure from the manufacturer a guarantee for the equipment for a period of 60 months, which time shall commence from the date of delivery. Manufacturer shall certify upon request that all materials furnished will conform to this specification. The manufacturer or his designated representative shall be responsible for determining and setting all required range and emitter intensity for the emergency vehicle operation.

Construction Methods:

All equipment except the vehicle emitter assembly shall be installed and wired in a neat and orderly manner in conformance with the manufacturers' instructions. The vehicle emitter assembly shall be delivered to a designated CCD representative.

Installation of the vehicle emitter assembly shall be the responsibility of the CCD Fire Department.

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CCD EMERGENCY VEHICLE TRAFFIC SIGNAL PRIORITY CONTROL SYSTEM

Traffic signals owned by the State that have optical pre-emption equipment owned and maintained by the CCD shall have an Auxiliary Equipment Cabinet (AEC) attached to the controller cabinet if required by the CCD Traffic Engineer. The optical pre-emption equipment shall be housed in the AEC.

Detector cables shall be continuous with no splices between the optical detector and the AEC. Detector locations shown on the plan are for illustration purposes. Exact location shall be determined by the Contractor or the Department's designated representative for the best possible line of sight.

If not present in an existing traffic controller cabinet, the following items shall be installed and connected, in conformance with the current CCD specifications for Traffic Control Equipment, "D" Cabinet Requirements (Pre-emption Type):

1. Controller "D" harness and adapter.
2. Pre-emption termination panel with terminal block and relay bases.
3. Pre-emption disconnect switch, mounted on the emergency switch panel (on inside of cabinet door).
4. Pre-emption test buttons, mounted on the pre-emption termination panel.

All connections from the phase selector to the "D" harness and to the cabinet wiring shall be made at the termination panel. The termination panel shall have AC+ Lights, AC-, and a switched logic ground. The switched logic ground feeds all the pre-empt inputs to the phase selector. When switched off by the pre-emption disconnect switch, the traffic controller shall not be affected by pre-empt calls from the optical pre-emption system. A minimum of two test buttons shall be provided. If there are more than two pre-empt runs, a button for each shall be installed. A chart or print out indicating the program steps and settings shall be provided along with the revised cabinet wiring diagrams.

Contractor shall test the pre-emption system per the following:

1. Notify the system owner/user, such as the CCD Fire Chief and CCD Traffic Engineer, for the scheduled inspection

2. Request a CCD Fire Department representative and an emergency vehicle, which has an emitter to conduct the test. If not available, the Contractor shall provide an emitter.

3. In the presence of the Engineer and the municipal representative, test each pre-empted approach with the emergency vehicle. Test the following items of the system:

   i. Confirm that the emitter activates the phase selector and the phase selector activates the correct pre-emption input to the controller.
   ii. Confirm adequate range. The traffic signal must be pre-empted to green sufficiently in advance of the emergency vehicle arrival. The vehicle emitter shall initiate pre-emption at a minimum distance of 548.6M (1800 feet).

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CCD EMERGENCY VEHICLE TRAFFIC SIGNAL PRIORITY CONTROL SYSTEM

iii. Confirm there are no false calls. Keep the emitter active as the emergency vehicle passes through the intersection. No other optical detectors shall sense the strobe.

4. Document the test. Provide the CCD Traffic Engineer and, upon request, the municipality copies of the test results.

If a malfunction is found or the system needs adjustment (such as range, emitter intensity, or detector location), schedule a follow-up test. Repeat the above steps for all approaches that did not pass.

All adjustments such as emitter intensity, phase selector range, sensitivity, detector placement, shall be made at the intersection by the Contractor so that the optical pre-emption operates correctly with other major manufacturers' equipment currently owned by the town.

Subsection 614.13 shall include the following:

Emergency Vehicle Traffic Signal Priority Control System units shall include a four-channel card and the number of detectors as shown on the plans. The item shall include all labor, materials, and ancillary hardware required to provide a fully functioning system to the satisfaction of CCD and Accepted by the Department.

REVISION OF SECTION 614
CCD TRAFFIC SIGNAL POLES – GENERAL

Section 614 of the Standard Specifications is hereby revised for this project as follows: Subsection 614.08 (g) shall include the following:

Traffic Signal Poles.

All traffic signal poles and mast arms shall conform to City and County of Denver (CCD) Standards and the local utility company's (Xcel Energy) requirements. The traffic signal pole standards are shown below:

All traffic signal poles shall include a 10 foot long luminaries mast arm and a 250 WATT high pressure sodium curvilinear style luminaries in accordance with the current City and County of Denver Standards. Prior to order of traffic signal poles, mast arms and luminaries, Contractor shall submit material specifications to the CCD Traffic Engineering Services for approval.

All traffic signal mast arm poles and mast arms shall be powder coated in accordance with the following specifications:

General
Super Durable Powder Coating: The super durable powder coating shall consist of a urethane or triglycidyl isocyanurate (TGIC) polyester powder, and provide a minimum of 3 times the gloss retention, color retention and ultraviolet light (UV) resistance as standard powder coatings. Color shall be dark olive green, in conformance with Federal Specification No. 14056.

Surface Preparation.
The exterior steel surface shall be blast cleaned to Steel Structures Painting Council Surface Preparation Specification No. 6 (SSPC-SP6) requirements utilizing cast steel abrasives conforming to the Society of Automotive Engineers (SAE) Recommended Practice J827. The blast method is a recirculating, closed cycle centrifugal wheel system with abrasive conforming to SAE Shot Number S280.

The exterior and interior surfaces of the pole shafts shall be hot dip galvanized from the base end for a length of approximately 12.0'.

Interior Color.
Interior surfaces (pole shafts only) at the base end for a length of approximately 2.0' shall be mechanically cleaned and coated with a zinc rich epoxy powder. The coating shall be electrostatically applied and cured in a gas fired convection oven by heating the steel substrate to a minimum of 350 degrees Fahrenheit and a maximum of 400 degrees Fahrenheit.

Exterior Coating.
All exterior surfaces shall be coated with urethane or triglycidyl isocyanurate (TGIC) polyester powder to a minimum film thickness of 2.0 mils (0.002"). The coating shall be electrostatically applied and cured in a gas fired convection oven by heating the steel substrate to a minimum of

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CCD TRAFFIC SIGNAL POLES – GENERAL

350 degrees Fahrenheit and a maximum of 400 degrees Fahrenheit. The thermosetting powder resin shall provide both intercoat as well as substrate fusion adhesion that meets 5A or 5B classifications of ASTM D3359.

Packaging.

Prior to shipment, small poles shall be wrapped in 0.188" thick Ultraviolet inhibiting plastic backed foam. Larger poles shall be cradled in a 1.0" rubberized foam base.

Handling and Shipment.
Poles shall be handled in a manner that will preserve the overall appearance and prevent damage to the coating. The use of chains or cables for loading, unloading, or installing is prohibited. Only ¾ inch diameter or larger nonabrasive nylon rope or equivalent nylon belting will be used. Adequate hold-downs and appropriate blocking shall be utilized for shipping to prevent load movement and damage to the outer coating in transit. No handling should be allowed until "dry through" condition has been achieved with the coating.

Delivery, Installation, and Acceptance of Poles.
Extra care will be taken not to damage the coating. Upon arrival of the poles at the delivery point, neither chains nor cables will be used to either unloading or installation of poles.

Procedure for Field Touch-Up.
The pole manufacturer will furnish extra paint, both primer and color coat, to satisfy the needs of field touch-up requirements, in the event of minor physical damage to the coating from handling or transit. Damaged area must be clean and dry before repair application. Field touch-up will be at the direction of the pole manufacturer or their authorized representative.

REVISION OF SECTION 614
CCD TRAFFIC SIGNAL CONTROLLER
(SOLID STATE) (FULL-ACTUATED) (12 PHASE)

Section 614 of the Standard Specifications is hereby revised for this project as follows: Delete Subsection 614.08 (b), and replace with the following:

Traffic Signal Controllers – General

This specification sets forth the minimum requirements for a shelf-mountable, two through twelve phases, fully-actuated, digital, solid-state traffic controller. The controller shall meet, as a minimum, all applicable sections of the NEMA Standards Publication No. TS2-1998. Where differences occur, this specification shall govern. Controller versions shall be available to comply with NEMA TS2"Types 1 and 2. Type 2 versions of the controller shall be capable of operating as a Type 1.

The controller shall meet or exceed the specifications of the Econolite Cobalt Fully Actuated ATC Controller (http://cobalt.econolite.com/pdf/Cobalt_ATCTouch_Hardware_Specification.pdf), or an equivalent approved by the City and County of Denver (CCD) Traffic Engineering Services.

Subsection 614.09 shall include the following:

The Contractor shall deliver the traffic signal controller, and cabinet assemblies and other auxiliary hardware, to the CCD Traffic Operations Center at 5440 Roslyn Street, Building E, Denver, Colorado 80216; 6 weeks before installation for controller programming. The Contractor shall coordinate the pick-up of the controller and cabinet assembly from the CCD Traffic Engineering Services and shall install it at the proper location. The Contractor shall coordinate pick-up times with Chris Lillie at 720-865-4066.

The controller shall be installed in accordance with the details shown in the plans and in accordance with manufacturer's recommendations.

Subsection 614.13 shall include the following:

Traffic Signal Controller (Solid State) (Full Actuated) (12 phase) shall include pedestrian detectors and all auxiliary equipment required on the plans and shall include all work necessary to provide and install a complete system. Connection of the controller to the fiber optic interconnect system is included with this work.

REVISION OF SECTION 614
RAMP METERING CONTROLLER

Section 614 of the Standard Specifications is hereby revised for this project as follows:

In subsection 614.08, delete (b) and (c) and replace with the following:

(b) Ramp Metering Controllers – General. Each controller shall be a Controller Intelight 2070LC and include the ramp metering firmware. The ramp metering firmware shall be compatible with the CDOT's ramp metering software, CDOT ramp metering system and have capabilities for a centralized ramp control system

The controller hardware and ramp metering firmware to be provided for this Project must be Approved by the Department prior to the order of the equipment, firmware and software.

In addition to the manual two "D" size (24" x 34.5") drawings of all schematics and assembly prints contained in the manual shall be supplied for each twenty controllers or revisions change.

Section 1.8.5.3.3 shall be modified to read "A minimum 100-hour burn-in of all modules is required. This burn-in shall include 48 hours of monitored testing at the high and low temperatures as described in 1.8.3.7.1 and 1.8.3.7.2."

Controller Cabinets. The controller cabinet shall be Model 334. Each cabinet shall be natural aluminum with anchor bolts in accordance with the FHWA-IP-78-16 specification. The input files shall meet the requirements of the split input file below. Unless otherwise specified in the Contract, the cabinet shall include the following:

Quantity	Item
1 ea	ATC
2 ea	Internal (1 per door) fluorescent lamps
2 ea	Model 430 Transfer Relays
1 ea	PDA-3 with Model 206 24 VDC power supply
2 ea	Model 204 2-circuit Flasher (cube type, 25 AMP output)
3 ea	Model 200 Load Switch (cube type, 25 AMP output with I/O indications)
1 ea	208 Watchdog Monitor - Developer shall be responsible for providing any additional accessories needed for connectivity to ATC, e.g., jumpers, connectors, etc., per Section 7 of the ATC Standard Version 6.
1 ea	New York 330 Pull-out Drawer Assembly
1 ea	Transient Voltage Surge Suppression
1 ea	Split Input File
1 ea	Standard Output file with terminal strips
1 ea	PDA Power Supply

Each cabinet shall have two doors and Corbin #2 Locks.

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REVISION OF SECTION 614
RAMP METERING CONTROLLER

The cabinet shall have a polyester powder coating base wheel silver in color (used on CDOT ramp metering cabinets) that have exterior application excellent ratings for overbake stability, exterior durability, and corrosion protection. Top coating shall be anti-graffiti power paint applied at a thickness of 2.4 mils.

The cabinet shall have a hinged protective shield over the circuit breakers to prevent them from being accidentally turned off. The hinged shield shall be mounted in such a way that the switches are still readily visible to the technician and can be easily turned on or off.

Split Input file. The split input file shall be an SF 170, which will operate in the standard 332/336 cabinets. The split input file shall use the same form factors as the present (older) input file and shall be completely interchangeable with these older input files except as follows. The input file shall use a split 22-pin connector (2 rows or 22 pins) which provide for 44 unique contacts, rather than the 22 double contacts as provided by the former input file.

This design shall interface electrically with the older 2 and 4 channel devices available under the 170 and NEMA TS1 specification as well as the newer 2 and 4 channel devices as specified in the TS2 NEMA specification.

The input file shall be divided into two partitions. The first partition shall include the first eight slots from the left; the second partition shall include the next six slots.

The serial/TTL Transmit and receive pairs shall be wired across the back panel. TXO, DXO, and Ground0 serve the first eight slots; TX1, DX1 and Ground1 serve the next six slots. Back plane addressing is automatically assigned in the rear of the input file, such that Slot 1 – Address 0, Slot 2 – Address 1 . . . Slot 8 = Address 7(all three lines low)

Addressing from the front of any input device shall override the back plane addressing.

Serial connections shall use a standard quick lock connection.

Transient Voltage Surge Suppression System. Transient Voltage Surge Suppression (Surge Protection) shall be a solid-state device with a maximum surge current capacity of 6500 peak current amps x 1 @ 8 X 20 microsecond wave.

The unit shall be UL recognized, both 1449 and 508. The enclosure is to be rated as a NEMA 1 and resistant to oil, moisture, dust and other airborne contaminants.

The units shall be fused (no thermo fusing allowed). Components shall be suitably spaced and have a sub-nanosecond response time (potting compound is not allowed). The Surge Protection is to be suitable for continuous line voltage of a maximum of 130 volts. Nominal clamping voltage shall be no more than 200 volts.

Unit shall have a failure indicator and alarm suitable for RTU connection. The operating temperature shall be -40ºC to +70ºC EMI-RFI noise attenuation to 40 dB. Capacitance shall be 1 to 1.5 microfarad per line.

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REVISION OF SECTION 614
RAMP METERING CONTROLLER

Neutral to ground/phase to ground connection is not allowed. The Unit shall be modularly designed for quick replacement with no tools needed.

The unit shall be mounted no more than 8 inches from the incoming power termination point and terminated in parallel with the incoming power.

The manufacturer must have a satisfactory performance record with this specific device for a minimum of five years.

REVISION OF SECTION 614
CCD DOUBLE CONVERSION UNINTERRUPTED POWER SUPPLY SYSTEM

Section 614 of the Standard Specifications is hereby revised for this project as follows:

Subsection 614.08 shall include the following:

The double conversion uninterrupted power supply system (UPS) shall provide emergency battery power to the traffic signal controller. The work consists of furnishing and installing an UPS in accordance with the City and County of Denver's standards and shall conform to the following specifications:

Operation.

The UPS system shall be capable of producing a fully regenerated, conditioned, pure sine wave AC. The online operational mode shall be continuous to all loads. It shall incorporate a high frequency Pulse-Width Modulated technology and shall use an input rectifier, charger, battery and inverter in a single board configuration. The UPS double conversion UPS shall provide a clean, pure AC sine-wave output at all times with a voltage input variation of 85VAC to 145VAC while providing 120VAC to the connected load at all times. The UPS shall be capable of operating in the voltage range of 85VAC to 135VAC without using the batteries and always provide a regulated output to the protected loads.

The input rectifier shall be rated at 2.5 times the output rating of the inverter.

The Inverter circuit shall be in continuous operation at all times (constant duty). The inverter shall be rated for 100% duty cycle and simultaneously fed from the rectifier and battery to eliminate any switching to battery or transitions during power fluctuations or power interruption. The inverter's output shall be pure clean sine wave with an efficiency of up to 85%.

The constant duty operation shall be rated in total watts. This will enable the traffic UPS to support any combination of signal heads whether Incandescent, LED or Neon, by any manufacturer, regardless of power-factor.

The UPS shall be capable of operating from a generator source without the need for over-sizing the UPS system. During operation from a generator source, the UPS shall operate in a normal fashion and provide filtered and regulated power with or without automatic input/output frequency synchronization. Upon excessive generator frequency drift, the UPS shall compensate through regeneration and supplying both continuous frequency and voltage regulation to the protected load.

The UPS shall be capable of glitch ride through capabilities and provide a seamless output to the connected load during this anomaly without the use of the batteries.

The UPS shall be capable of providing an overload output rating of 120% for 60 seconds, 150% for 10 seconds to any combinations of signal types whether Incandescent, LED or Neon during inrush or overload conditions.

The UPS shall have an internal static bypass that will transfer to line power if over load exceeds 150% for more than 5 sec. This bypass will maintain the load until this overload has cleared.

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REVISION OF SECTION 614
CCD DOUBLE CONVERSION UNINTERRUPTED POWER SUPPLY SYSTEM

The UPS shall have a separate Neutral detecting circuit that shall monitor loss of utility neutral and completely disconnect any input source to the UPS system.

The UPS shall have an input back feed relay operating in series with the Neutral monitoring circuit.

Upon loss of utility power, the UPS inverter shall continue to provide seamless pure sine-wave AC from the batteries without switching, transfer or changing its' operating status. The UPS will use the battery mode in '0' ms. This will insure that the UPS provides pure sine wave power under all conditions, at all times without interruption.

The UPS will continue to provide generated AC from the inverter until the batteries are depleted. When the batteries have been depleted, the UPS will ensure upon the return of utility power that the UPS will restart automatically and provide regenerated AC to the protected equipment and allow the equipment to resume normal operation.

The UPS shall be capable of operating in a full regenerated, power-conditioning mode with depleted batteries or failed batteries. The regenerative power conditioning will ensure that there will be regulated and conditioned pure AC power to the equipment. This regenerative mode will provide extended brown-output protection with wide input line regulation, noise filtering and surge protection.

The UPS shall operate in an uninterruptible regenerative on-line mode during flash or normal signal operation.

The UPS shall be rated at Unity Power Factor. The output VA and Watts rating shall be equal on the output at all times.

The UPS shall be capable of COLD starting without AC present and provide AC power to the load.

The UPS shall be capable of self-diagnostics during start up or with the use of the front panel TEST button.

The UPS case shall be constructed from .064 aluminum and carbon steel.

The UPS input and output connections shall be power pole quick lock connector to eliminate exposed terminals or connections.

The UPS to bypass interconnect harness shall be reversible with matching A power connectors that will prevent risk of shock, or damage to the connected equipment.

The UPS shall be capable of Hot-Swapping the batteries or battery bank, without shutting down the UPS.

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REVISION OF SECTION 614
CCD DOUBLE CONVERSION UNINTERRUPTED POWER SUPPLY SYSTEM

The UPS shall be capable of being Hot-Swapped during normal operation when used with the external Hot Swap Bypass. The UPS may also be shut-off with the Hot Swap Bypass in place without loss of AC to the loads.

The UPS shall be capable of providing a replaceable relay card with relay output contacts for AC fail, Inverter ON, Low Battery, Battery Fail, Bypass and Alarms.

The UPS relay card may be replaced with an SNMP card for SNMP communications and information.

The UPS shall provide a programmable Dry Relay output for flash.

The contacts shall be provided in N/O and N/C positions. The delay timer shall be a maximum of 10 hours.

The timer shall be front panel mounted.

The Timer dial shall be 4.7 inches in circumference.

The timer shall have a scale in increments of 1s to 10seconds. This scale can be changed to indicate 1 minute, to 10 minutes or a maximum scale of 1 hour to 10 hours.

The scale shall be controlled by two (2) separate dip switches on the timer face.

The timer shall indicate using a flashing RED LED that the timing function is operating. The timer shall use a steady RED LED to indicate that the timing is now completed

The timer shall count in a down mode to ‘0’ from the preset time indicated on the scale.

The LED indicators shall provide status for AC line, UPS Battery Mode, Charging, Low Battery, Fault, Bypass, Percentage of Load and Battery Charge.

The Event counter and Hour meter may be rest to ‘0’ using separated buttons.

The UPS shall have a battery changer rated at 200 watts @ 36VDC with an optional of 400 watts.

This charger shall be completely separate from the rectifier/inverter included with the main UPS board.

The UPS chargers may be used in a parallel configuration for increased charger ratings.

The UPS uses a redundant internal 1 amp charger that will continue to charger the batteries if the separate board charger fails.

The UPS may be used with redundancy in mind with the use of the Dual Hot Swap Option. That will provide a secondary UPS source in less than 20ms. The Secondary UPS may be connected to the alternate input of the Hot Swap Bypass.

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REVISION OF SECTION 614
CCD DOUBLE CONVERSION UNINTERRUPTED POWER SUPPLY SYSTEM

The Flash programming shall be a simple and field programmable without the use an external connected device such as a laptop or computer.

The Hot swap Bypass shall allow the UPS to be removed or installed at any time during normal load operation.

The UPS shall include standard graphical real time software and connection cable.

The UPS shall be capable of sending programmable system alarms to the Econolite "icons" Traffic Management System.

Physical Description.

The UPS shall consist of 3 major components. The Main board Rectifier/Inverter, charger and control board.

The main board shall consist of a true-sine-wave constant duty high frequency inverter utilizing high frequency pulse-width modulated technology.

The input rectifier shall be rated for the total wattage output rating of the UPS including the

150% overload and the charger rating. The inverter shall be a high efficiency constant duty design with and efficiency of 83%. The inverter shall include its' own static bypass which provides an alternate AC path during overload and or Inverter alarm conditions.

The heat-sink shall be a continuous aluminum extrusion design with plenum directed airflow cooling. The 12VDC dual stage cooling fans shall be variable speed controlled by the logic board.

The charger portion shall be a 3 stage hysterisis .5 amp, 36 or 72VDC charger with temperature compensation. The supplementary charger, is a parallel design rated for 200, 500 and 1000 watts.

The electronic control board shall monitor the rectifier and inverter functions. It shall also provide the overall control of all the UPS functions and or operational capabilities.

Mounting Configuration.

The UPS shall be shelf mounted or rack mounted per the documents. Shelves and cabinets shall be supplied by others. Where rack mounting is required, the 170 style mounting method shall be a 19 inch rack mount. Rack mounting ears shall be removable.

A separate standalone NEMA Traffic cabinet may be required to provide adequate operations.

Four rubber feet shall be installed on the bottom of the unit for shelf mounting.

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REVISION OF SECTION 614
CCD DOUBLE CONVERSION UNINTERRUPTED POWER SUPPLY SYSTEM

Battery System.

The batteries shall be comprised of a quantity of three (3), high temperature, deep cycle (45AH) batteries which have been proven under extreme temperature conditions. The battery system or configuration shall consist of one string. Each string shall be 36 VDC. The batteries shall be provided with the appropriate interconnect cables. The battery cables shall have a minimum conductor size rating of #10.

The battery cable shall consist of a quick release connector rated at 25 amps. For the purpose of safety, the connector shall have recessed pins and keyed interlock to prevent reversal of connection or separation.

Battery construction shall be of a polycarbonate high temperature design combined with high, pure lead content with internal resistance of .0028 ohms and a high impact poly case construction, to with stand high vibration and shock. The connections shall be of stainless steel 3/8 stud, with 3/8 stainless nut and locking washer. Removable lifting handle shall be standard.

The batteries shall also meet the following characteristics:

Nominal voltage:	12VDC Capacity@ 25C: 45AH Approx weight: 13.5Kg Internal Resistance: 9.5 mOhms
Dimensions:	197mm x 165mm x 170mm (7.76 x 6.50 x 6.69)
Capacity (10hr rate):	75c-112% 65c-108% 55c-105% 25c-100% 0c- 85% -15c- 65%
Self Discharge:	3 months 91% capacity remaining

6 months 82% capacity remaining

12 months 65% capacity remaining

Operating Temperature:	-15c to +75C Float Voltage: 13.5 to 13.80
Cyclic charging voltage:	14.5 to 14.90
Maximum charge current:	12A Terminal material: Copper
Maximum discharge current:	400A (5 sec)

The system must be 36 volt DC maximum (no exception).

Electrical Specifications.

The unit shall meet the following electrical specifications:

Design:	Double Conversion true on line.
Nominal input:	110, 115 & 120v AC single phase dip switch selectable.
Input Voltage Range:	80v to 140v AC
Input frequency:	50/60hz (47 to 63)

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REVISION OF SECTION 614
CCD DOUBLE CONVERSION UNINTERRUPTED POWER SUPPLY SYSTEM

Efficiency:	83 %
Input configuration:	3 wire with ground
Input Protection:	15 amp re-settable breaker (on UPS 700) Input
Current:	10.4 amps (includes charger) (on UPS 700)
Power Rating Continuous:	700 watts, 1400 watts, 2100 watts
Output Current:	@ 700 watts 5.8 amps / 11.6 @1400/ 17.7@2100
Output regulation:	+/- 3% with 100% resistive load
Output regulation w/low battery:	+/- 3% with 100% resistive load
Output Voltage:	120v AC
Output Wave Form:	Pure sine wave
Harmonic Distortion:	3% Linear Load; 5% Non Linear Load
Dynamic Response:	+/- 5% RMS for 100% step load change

1 ms recovery time

Overload Capability:	120% for 60 sec

150% watts for 10 sec

Charger:	200 watt 36VDC UPS 700, 72VDC on UPS 1400 Parallel 400, 1000 and 2000 watt.
Surge:	ANSI-C62.41
Fault Clearing:	Current Limit and automatic to bypass
Short Circuit protection:	Output Breaker / Fuse, then shut down
Load Power Factor:	6 leading to .6 lagging
Output Connection:	power pole connector 6 pin keyed. DC
Connection:	50 amp Keyed Recessed connector
Recognition:	UL Recognized & IEE 587 / C62.41 on main UPS board
Mechanical:	

The UPS shall meet the following physical dimensions: For 700 W UPS:

Size:	6.00" H x 10.5" D x 15.15" W
Weight:	18 lbs

The enclosure shall be constructed of 0.064 Carbon steel and aluminum. The enclosure shall be painted with powder coat paint with a minimum of 1.5 mil thickness.

Environmental.

The UPS shall meet or exceed NEMA temperature standards from –40c to + 74c. Communications, Control & Diagnostics LED indicators shall be provided for line monitoring, battery mode,

charging, low battery, fault / bypass load level, battery level and ground fault. Manual test functions shall be available for alarm function, low battery, battery fail, bypass and overload. An RS 232 port with communication software shall be provided for real time UPS operational status in place of a relay status card when required.

The relay status card shall have the following I/O via contact closure:

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REVISION OF SECTION 614
CCD DOUBLE CONVERSION UNINTERRUPTED POWER SUPPLY SYSTEM

1. Bypass ON
2. AC fail or out of tolerance.
3. AC normal or in tolerance.
4. Inverter is operating (ON)
5. Battery low
6. Battery failed or bad
7. UPS general alarm
8. Ground (logic)
9. Apply 6 to +25VDC
10. Between pin 9 and 10, will shut the UPS down

Options.

The UPS must be able to accept the following future options

1. SNMP/WEB monitoring.
2. 24/7 Adjustable perpetual timer.
3. Generator input option for hot swap bypass switch.
4. Rack mount hot swap bypass switch.

In place of the relay card, an SNMP card can be installed that shall support TCP/IP, UDP, SNMP, and HTTP protocols and shall provide the SNMP MIB for UPS monitoring and UPS status. Remote access to UPS real time information including unit identification, data logging and UPS status in real time shall also be provided on a by unit basis. It shall be possible to use Microsoft Internet

Explorer for remote viewing of the following:

1. UPS load
2. Battery Charger status
3. UPS operation Normal/Alarm
4. Input Voltage
5. Output Voltage
6. Battery Voltage
7. UPS Temperature

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REVISION OF SECTION 614
CCD DOUBLE CONVERSION UNINTERRUPTED POWER SUPPLY SYSTEM

8. UPS information logging
9. Remote UPS battery testing.
10. Send output email if UPS status has changed
11. Built in reset with panel mounted led indicators for SNMP status.

The SNMP card shall have the following status LEDs:

LED(1)	Green LED: Status receiving Yellow: Data Transmitting
LED(2)	Green: SNMP connecting Yellow: SNM P functioning

The optional 24/7 timer shall be integral to the UPS. It shall include a DB9 connector to provide the connection and programming to the timer. This timer shall be programmable for any number of flash delays related to the time of day. It allows the complete flexibility of flash delay or skipping the flash during that particular event related to traffic flow and even holidays. The time shall have the follow features:

1. 7 days, 24 hrs Flash delay timing.
2. Perpetual Clock.
3. Maximum of 31 setting per day.
4. Timing resolution to the minute.
5. 4 Possible commands per event.
6. Real-time operation, editing functions will not interrupt the unit's functions.
7. J-Tag port for instant preload of complete 7-day schedule file.
8. SPDT 10 amp 240VAC /24VDC ratings.
9. Input Voltage 110 to 240VAC or 24VDC unregulated supply.
10. Plus! Capable of scheduling for holidays or specific year/dates.
11. Capable of operating at 2400 baud micro-modem for direct phone connection
12. Capable of operating at 1200 to 230,000 baud rate on a serial port.
13. Capable of log retention

An optional generator input shall be available for the UPS.

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REVISION OF SECTION 614
CCD DOUBLE CONVERSION UNINTERRUPTED POWER SUPPLY SYSTEM

Reliability:

Calculated MTBF shall be 120,000 hours based on component ratings. When bypass switch is installed, system MTBF shall increase to 160,000 hours.

Hot Swap Bypass Switch:

A hot bypass switch shall be provided and wired to function within the UPS system. The bypass switch shall have the following characteristics:

Bypass Rating:	30 amps maximum
Bypass Transfer:	Automatically to line in 20ms, '0' crossing at full load
Control:	Rocker On/Off switch indicating 'Auto' and Bypass
Relays:	AC internal Load relay at 'Zero Crossing' with parallel function DC relay for interlocking and protection failsafe mode to N/C for AC power direct to load when failure occurs or in Bypass position.
Protection:	Internal Snubber circuit for spike attenuation during transfer at 'Zero' crossing. Internal fuse required.
Connections:	Flush mounted power connector. With locked and keyed.
Indicators:	LED for Line Available, Bypass, Ups On Line, UPS Available.
Dimensions:	7.5 x 5 x 2.5
Weight:	1.4 lbs

Warranty:

A standard (2) two year manufacturer warranty shall be provided for all electronic components. All batteries shall carry a one year warranty.

Subsection 614.13 shall include the following:

Emergency Vehicle Traffic Signal Priority Control System units shall include a four-channel card and the number of detectors as shown on the plans. Emergency Vehicle Traffic Signal Priority Control System shall be measured and paid by the number of intersections at which the system is installed. The item shall include all labor, materials, and ancillary hardware required to provide a fully functioning system to the satisfaction of the Department.

REVISION OF SECTION 614
MICROWAVE VEHICLE RADAR DETECTOR

Section 614 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

This work shall consist of furnishing and installing microwave vehicle radar detectors in accordance with these Special Provisions at the locations shown on the Plans. Contractor shall order the Wavetronix SmartSensor HD, configuration software, mounting hardware, and compatible Click! DIN rail mountable components.

MATERIALS (Pole Mounted Within 40' of Traffic Control Cabinet)

The Microwave Vehicle Radar Detector (MVRD) shall include the radar detector unit, 20' standard combination power/data cable with connector, required length of un-terminated Belden 9330 or approved equal 4 pair separately shielded 22 AWG cable to reach from pole mounted communications cabinet to traffic control cabinet, data line surge suppressor, pole mount hardware, communications cabinet, and configuration software.

The radar detection unit shall be a non-intrusive device using frequency modulated continuous wave radar technology for the gathering of vehicle information including traffic volume, lane occupancy, individual and average speed, vehicle classification, and presence. It shall have auto configuration capabilities to simultaneously identify up to ten highway lanes with the ability to detect over center median barriers and accurately detect partially occluded vehicles. Weather shall not impact the radar detection of the unit. Wind or temperature change shall not cause the device's original field installation configuration to alter over time. The radar detection unit shall include the manufacturer's recommended power/communication cable. The radar detection unit shall meet the following minimum requirements:

(1)	Installation Type:	Side Fire or Forward Fire installation
(2)	Detection Zones:	Up to 10 Lanes Simultaneously
(3)	Detection Range:	3 to 250 feet
(4)	Detection Zone Resolution:	1 foot
(5)	Time Resolution:	2.5 msec
(6)	Elevation 3 dB Beamwidth:	65º
(7)	Azimuth 3 dB Beamwidth:	7º
(8)	Operating Frequency:	24.0 to 24.25 GHz (K-Band)
(9)	Communications:	RS-232 and RS-485
(10)	Power:	8.0 Watts at 9 to 36 Volts DC
(11)	Operating Temperature:	-40 to +165ºF (Ambient)
(12)	Humidity:	Up to 95% Relative
(13)	Shock:	10g 10ms Half Sine Wave

The communications cabinet shall be non metallic Nema 4x enclosure or equivalent, measuring 8 x 6 x 4 inches (H x W x D), and have a securable hinged door with weather proof seal to prevent the ingress of wind and water. The communications cabinet shall include an internal backplane with DIN rail and mounting bracket assembly for attachment to supporting pole.

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REVISION OF SECTION 614
MICROWAVE VEHICLE RADAR DETECTOR

The DIN rail mountable components to be installed inside the communications cabinet shall include a WX-SC-200 Click 200 data line surge suppressor with hot swappable protected busses. The Data Line surge suppressor shall provide protection for RS-232, RS-485, and DC power to the radar detection unit. Wiring for the surge suppressor shall be by means of pluggable screw terminals and include unprotected as well as protected RS-232 and RS-485 communications connectors and shall have a minimum operating temperature range of -29 to 165˚F up to 95 percent relative humidity.

MATERIALS (mounted inside 334 traffic control cabinet)

There shall be a 19" bent rack mount Din rail, a Din rail mountable WX-SC-206 Click 206 .05 Amp re-settable circuit breaker and switch, a DIN rail mountable WX-SC-201 Click 201 AC to DC power converter. The power supply shall accept input voltage from 100 to 240 VAC at 45 to 65 Hz and provide 24 VDC output at 1Amp. The power supply shall have a minimum operating temperature range of -29 to 165°F up to 95 percent relative humidity. The power supply shall provide for 100 percent power reserve for a minimum of 20 ms to protect against static voltage dips, transient failures of supply voltage, or continuous phase failures. There shall be a WX-SC-205 Click 205 AC lightening power line surge protector DIN rail mountable with hot swappable protected busses, and a WX-SC-200 Click 200 data line surge suppressor. The surge suppressor shall provide protection for RS-232, RS-485, and DC power. Wiring for the surge suppressor shall be by means of pluggable screw terminals and include protected and unprotected RS-232 and RS-485 communications connectors. The surge suppressor shall have a minimum operating temperature range of -29 to 165°F up to 95 percent relative humidity. The necessary number of input file-mountable WX-SC-174 Click! 174 four-channel and/or WX-SC-172 Click! 172 two-channel contact closure (loop emulator) modules with required RJ-11 patch cords shall be provided to emulate 1 primary and 1 secondary loop for each mainline lane.

CONSTRUCTION REQUIREMENTS

Two conduit access holes, not to exceed 1.5 inches shall be made on the bottom of the communications cabinet. One of these holes is to be used for the power/communications cable in from the sensor and the other for the power/communications cable out to the traffic control cabinet. The access holes shall be positioned at a location to ensure the proper, safe routing of wiring entering the cabinet. 3/4 inch Type 201 stainless steel strap used in conjunction with Type 201 stainless steel buckles shall be used to mount the communications cabinet to the structure so that the top of the cabinet is approx 5 feet above surrounding grade. The communications cabinet shall be oriented such that anyone working in the cabinet has direct line of sight with oncoming traffic. The Contractor shall be responsible for any necessary modifications or additions needed to mount the communications cabinet to the structure.

0.75 inch Type 201 stainless steel strap used in conjunction with Type 201 stainless steel buckles shall be used to mount the radar detection unit at a height and angle determined by roadway off-set and detection distance in accordance with manufacturer’s recommendations and shall be properly grounded per the manufacturer’s specifications.

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REVISION OF SECTION 614
MICROWAVE VEHICLE RADAR DETECTOR

The manufacturer's recommended power/communication cable shall run on the interior of the mounting structure from the radar detection unit to the communications cabinet. A hole not to exceed 1.5 inches shall be made 12 inches below the radar detection unit to allow passage of the power/communications cable into the structure.

The Contractor shall ensure strain relief and drip loops in the power/communication cable before the cable enters the structure in accordance with manufacturer's recommendations. Two holes not to exceed 1.5 inches shall be made below the communications cabinet to allow the power/communications cables to pass from the interior of the structure to the interior of the communications cabinet. Flexible conduit shall be used to run cables from the structure to the communications cabinet.

The Contractor shall run and connect power from the structure to the 0.5A circuit breaker and power line surge protector in the 334 traffic control cabinet. The Contractor shall wire supply power, power supply, surge suppressors, breaker, and radar detection unit in accordance with the manufacturer's recommendations. The radar detection unit shall be wired to support RS-232 serial communications.

All holes shall be free of burs and sharp edges prior to the installation of all cable, conduit, and conduit nipples. All cable entrances in structures, conduits, and cabinets shall be sealed and waterproofed. All wiring and electrical connections shall be performed in conformance with the latest version of the NEC.

The Contractor shall configure the radar detection unit to detect all lanes, in accordance with the manufacturer's recommendations.

The units shall be environmentally hardened for outdoor use with a temperature range of -10 to +80 degrees centigrade and available in one, two or four RS-232 port units. Also included at this location, a 120 volt AC to 24 volt DC power supply shall be included. This unit shall have a slim line DIN mountable case and be mounted to DIN rail in the 334 traffic control cabinet. The Contractor shall provide units which are compatible with current devices installed at various locations.

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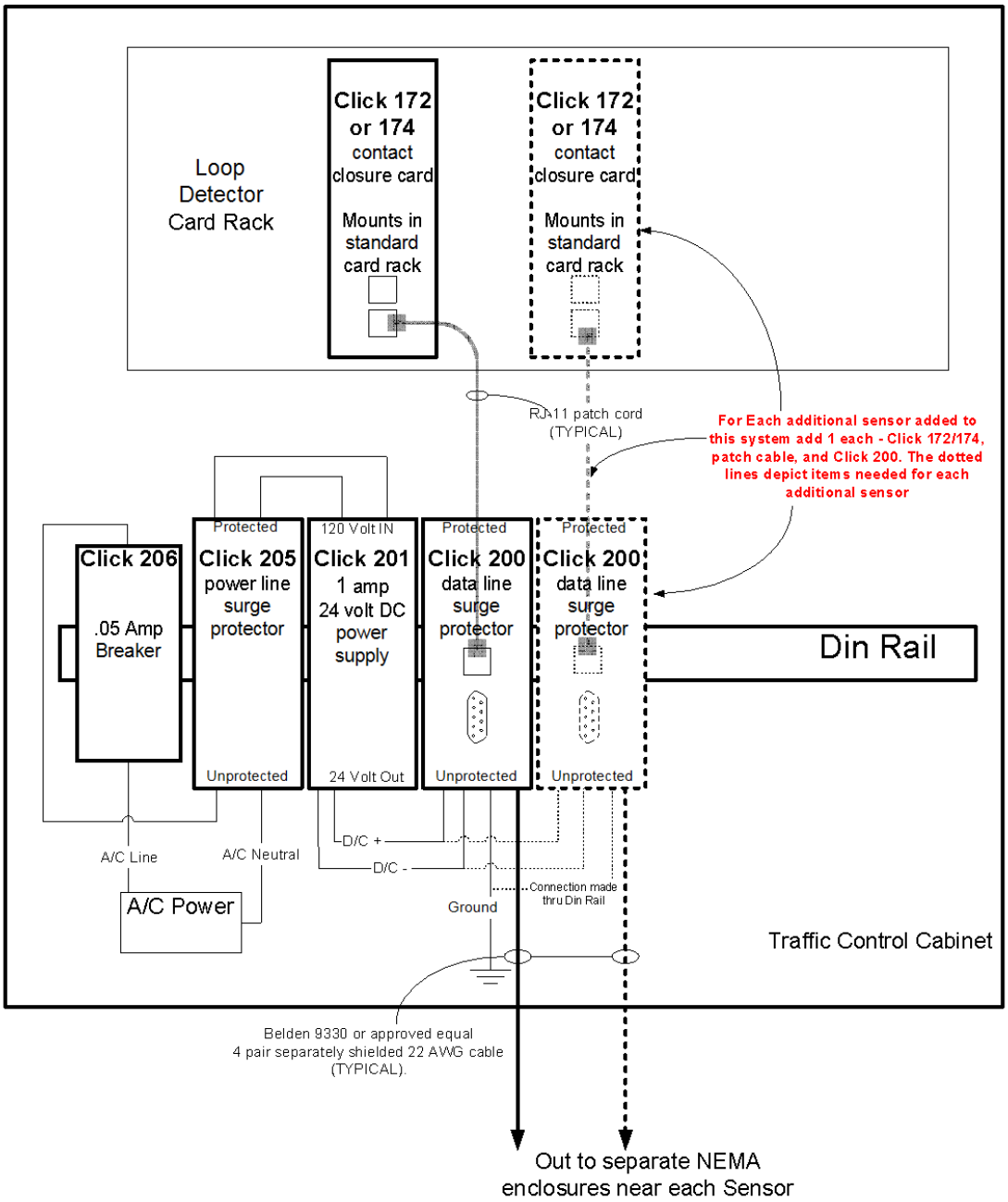
REVISION OF SECTION 614
MICROWAVE VEHICLE RADAR

Drawing showing the equipment needed in the Control Cabinet when Installing Wavetronix SmartSensors with contact closure.



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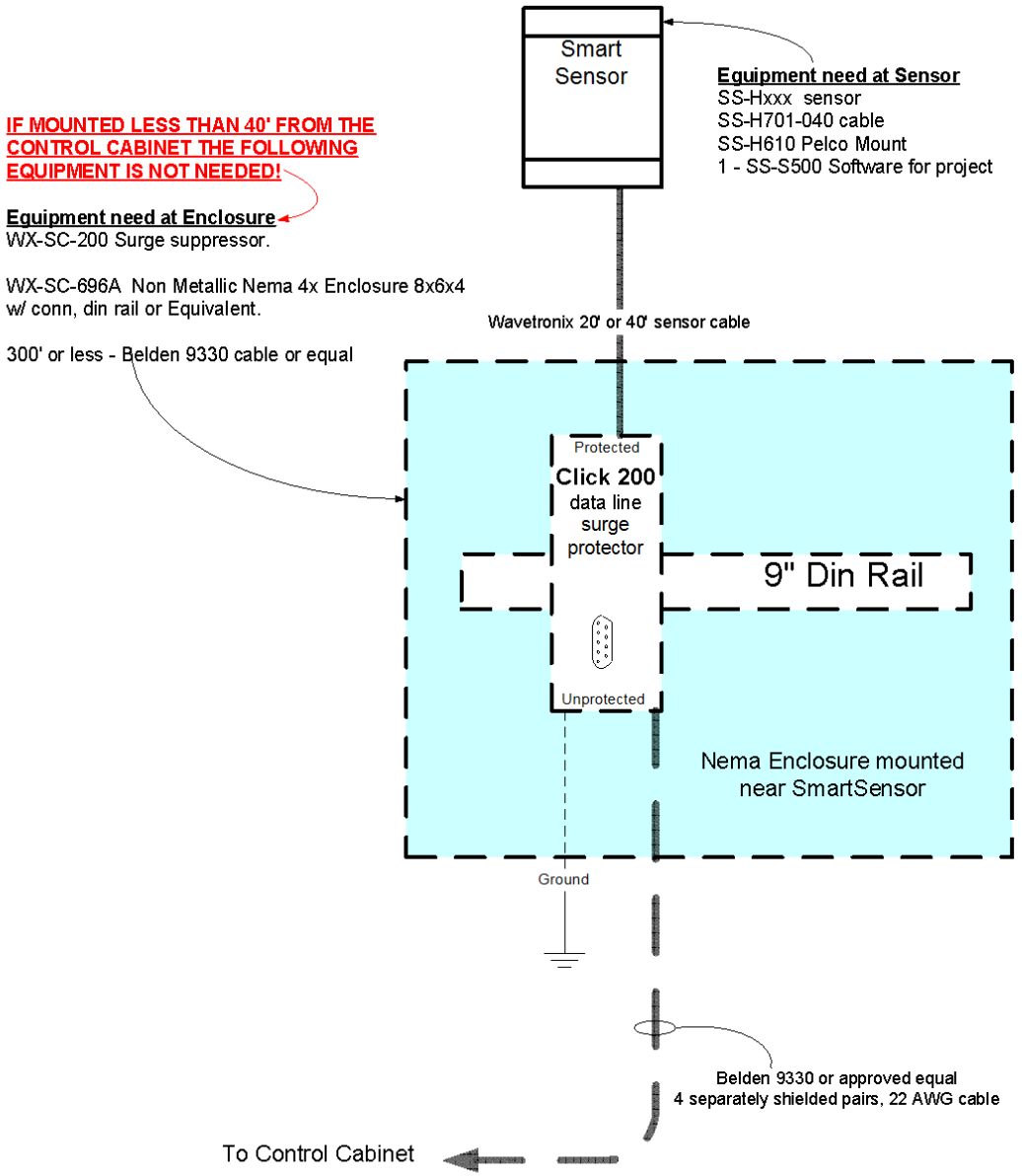
REVISION OF SECTION 614
MICROWAVE VEHICLE RADAR DETECTOR

Equipment drawing for each SmartSensor located less than 300' from control cabinet (as the wire travels).



REVISION OF SECTION 614
MICROWAVE PRESENCE DETECTOR

Section 614 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

This work shall consist of furnishing and installing a Wavetronix SmartSensor Matrix microwave vehicle radar detector unit for passage and demand detection in accordance with these Special Provisions, and per the manufacturer's recommendations. This sensor shall only be used when detection is on a bridge deck.

MATERIALS

The Microwave Presence Detector shall include the radar detector, sensor mounting kit hardware, SmartSensor cable from unit to traffic control cabinet, data line surge suppressor, pole mount hardware, communications cabinet equipment, cabinet interface device, 4-channel contract closure input cards, DIN rail contact closure module, and configuration software.

There shall be a 19" bent rack mount Din rail, Click 600/650 cabinet interface devices, a Din rail mountable WX-SC-206 Click 206 .5 Amp re-settable circuit breaker and switch, a DIN rail mountable WX-SC-201 Click 201 AC to DC power converter. The power supply shall accept input voltage from 100 to 240 VAC at 45 to 65 Hz and provide 24 VDC output at 1Amp. The power supply shall have a minimum operating temperature range of -29 to 165˚F up to 95 percent relative humidity. The power supply shall provide for 100 percent power reserve for a minimum of 20 ms to protect against static voltage dips, transient failures of supply voltage, or continuous phase failures. There shall be a WX-SC-205 Click 205 AC lightening power line surge protector DIN rail mountable with hot swappable protected busses, and a WX-SC-200 Click 200 data line surge suppressor. The surge suppressor shall provide protection for RS-232, RS-485, and DC power. Wiring for the surge suppressor shall be by means of pluggable screw terminals and include protected and unprotected RS-232 and RS-485 communications connectors. The surge suppressor shall have a minimum operating temperature range of -29 to 165˚F up to 95 percent relative humidity. The necessary number of input file-mountable WX-SC-174 Click! 114 four-channel contact closure (loop emulator) modules with required RJ-11 patch cords shall be provided to emulate the demand and passage detectors at the stop bar.

CONSTRUCTION REQUIREMENTS

The Contractor shall install the unit in accordance with the manufacturer's recommendations. Construction shall include all necessary work to provide a fully operable unit, including mounting the bracket, aligning the sensor, applying the dielectric compound to the sensor connector, connecting the SmartSensor conductor cable to the sensor, wiring to the device and in the 334 cabinet, mounting of DIN rail, and installation of contact closure cards.

A 0.75 inch Type 201 stainless steel strap, in conjunction with Type 201 stainless steel buckles, shall be used to mount the radar detection unit at a height and angle determined by roadway off-set and detection distance in accordance with manufacturer's recommendations and shall be properly grounded per the manufacturer's specifications.

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REVISION OF SECTION 614
MICROWAVE PRESENCE DETECTOR

The manufacturer's recommended power/communication cable shall run on the interior of the mounting structure from the radar detection unit to the 334 ramp meter cabinet. A hole not to exceed 1.5 inches shall be made 12 inches below the radar detection unit to allow passage of the power/communications cable into the structure. The Contractor shall ensure strain relief and drip loops in the power/communication cable before the cable enters the structure in accordance with manufacture's recommendations.

All holes shall be free of burs and sharp edges prior to the installation of all cable, conduit, and conduit nipples. All cable entrances in structures, conduits, and cabinets shall be sealed and waterproofed. All wiring and electrical connections shall be performed in conformance with the latest version of the NEC.

The Contractor shall configure the radar detection unit to detect all lanes, in accordance with the manufacturer's recommendations.

REVISION OF SECTION 614
CCD ETHERNET SWITCH

Section 614 of the Standard Specifications is hereby revised for this project as follows: Subsection 614.01 shall include the following:

This work consists of furnishing and installation of an Ethernet managed field switch, in the CCD controller cabinets. The switch shall be compatible with the existing system.

Subsection 614.08 shall include the following:

An Ethernet Switch is hereby added to the Standard Specifications and shall comply with the following specifications:

The magnum Ethernet managed field switch, shall be compatible with CCD's system as Approved by CCD and shall comprise of the following four parts:

1. 6KQ-24VDC base unit with four 10/100 copper ports in slot A (without 24VDC power supply).
2. 6KQ-RJ45 module with four 10/100 copper ports in slot B.
3. 6KQ4-MLC module with four 100Mb 2km multi-mode LC fiber ports in slot C.
4. 6KQ-BLNK blank cover for 1 unused module in slot C.

The field switch must also meet the following requirements:

May be configured with a variety of 10/100/1000 Mb fiber and copper port connector types - 16 total ports maximum.

Heavy duty and environmentally hardened fully enclosed metal case with advanced thermal design used as a heat sink (no fan).

Dual LEDs for all-around status viewing.

Wire speed filtering and forwarding across all ports - 802.3x flow control, 802.1p priority packet processing, self-learning 4K-node address table, large 240KB packet buffers for 10/100 and 120KB for 1000Mb.

The unit shall be configured as a minimum: Filtering/Forwarding Rate Performance:
Ethernet (10Mb):14,880 pps
Fast Ethernet (100Mb): 148,800 pps
Gigabit Ethernet (1000Mb): 1, 488,000 pps
Switching Processing Type: Store and Forward with IEEE 802.3x full duplex flow control, non-blocking
Data Rate: 10Mbps, 100Mbps and 1000Mbps
Address Table Capacity: 4K node, self-learning with address aging

- Packet buffer size: 240KB for 10/100 and 120KB for 1000Mb
- Latency: 5 µs + packet time (100 to 100Mbps); 15 µs + packet time (10 to 10 Mbps, and 10 to 100Mbps)

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REVISION OF SECTION 614
CCD ETHERNET SWITCH

- Throughput with 12 10/100 and 2Glink max.- 4.76M pps (Transmit)
- Back plane- 2.66 GB/s per slot LEDs:
- Per Port (one set at the port, one set on swivel top on right side)
- LK: Steady ON when media link is operational
- ACT: ON with receiver port activity
- FDX/HDX: ON = Full-Duplex Mode; OFF = Half-Duplex Mode
- 100/10: ON = 100Mbps speed; OFF = 10 Mbps

Network cable connectors:

- 1000Mb fiber ports: all standard Gb SFP Transceiver types supported
- 1000Mb copper ports: 10/100/1000Mb auto-negotiating, Cat5e & 6 UTP/STP
- 100Mb Copper and PoE: Category 5 UTP/STP; 10 Mb: Cat. 3, 4, 5 UTP/STP
- 100 Mb Fiber ports connector options: multi-mode FX-MTRJ, LC, ST, SC; Single-mode 15Km LC, 20Km SC and ST, and 40 Km "long reach" single-modes SC.

Operating Environment:

- Ambient Temperature: -40° to 140° F (-40° to 60°C)

Alarm Relay Contacts:

- One NC indicating internal power, one NC software controllable

DC Power Supply:

- 24VDC Power Input nominal (range 18 to 36VDC)

- Power Consumption: 35 watts worst case (for a fully loaded fiber model); 12 watts typical (for a small 4 port copper-only model)

Vertical mounting normal:

- Suitable for wall or DIN-Rail mounting

Testing Requirements_- The Contractor shall supply one unit of Ethernet Switch to the CCD Traffic Engineer for specification compliance testing and approval. If the product passes the specification compliance testing and approval evaluation, the Contractor will be notified to complete the order. If the product does not pass the specification compliance testing and approval evaluation by CCD-TES, the test unit will be returned back to the Contractor. The Contractor shall supply other units until CCD Accepts the test results.

Subsection 614.14 shall include the following:

Each package shall contain one Ethernet Switch, set of mounting bracket, Installation and User guides, and Product Registration Card.

REVISION OF SECTION 614
CCD TRAFFIC SURVEILLANCE CAMERA

Section 614 of the Standard Specifications is hereby revised for this project as follows: Subsection 614.01 shall include the following:

DESCRIPTION

This work consists of furnishing and installation of a traffic surveillance camera at City of County of Denver (CCD) operated and maintained traffic signals. Camera shall be compatible with CCD's existing traffic signal system, include all hardware, power and communication connection and be fully functional with CCD's fiber optic communications.

MATERIALS

Contractor shall provide camera from Panasonic WV-SW598A Super Dynamic PTZ Dome Camera that includes the following:

a) Resolution of 1,920 x 1,080 pixels up to 30 feet per second; 12x extra optical zoom at 1,920 c 1,080 resolution , 90x extra optical zoom at 640 x 360 resolution;
b) 360 degree endless panning; rain wash coating dome cover, approximate 1/3 inch type high sensitivity; MOS image sensor; super dynamic range and adaptive black stretch;
c) Produce a color image with a minimum illumination of 0.009 lux and monochrome image with 0.001lux F1.6 shutter speed of 16/30x and high gain mode; generate multiple simultaneous video streams of JPEG and H.264 high profile; GOP control as bitrate reducing technology, utilize 3D-digital noise reduction;
d) Rated to IP66, NEMA 4X standard against water and dust ingress, IEC 62262 IK10 vandal resistance;
e) Video motion detection with four programmable detection areas, 15 steps sensitivity level and 10 steps detection size, and provide up to thirty two areas of electronic privacy masking;
f) Variable image quality on specified area which sets different image qualities to up to two areas in the full view to reduce bandwidth and storage capacity requirements and offer the prioritized stream control which transmits a video stream;
g) full-duplex bi-directional audio communication between the camera and monitoring site
h) conform to the ONVIF standard

Camera

a) Image Sensor 1/3 type MOS image sensor
b) Scanning Mode Progressive
c) Scanning Area 5.35 mm (H) x 3.34 mm (V) {7/32 inches(H) x 1/8 inches(V)}
d) Minimum Illumination
   1) Color 0.009 lux (F1.6, Shutter speed of 1/30s, Gain: On(High))
   2) B/W 0.018 lux (F1.6, Shutter speed of 1/30s, Gain : On(High))

Lens

a) Vari-Focal Length 4.3 ~ 129.0mm {3/16 inches – 5-3/32 inch}
b) Max. Aperture Ratio 1 : 1.6 (WIDE) ~ 1 : 4.7 (TELE)
c) Angular Field of View
   1) 16:9 aspect ratio H: 2.6° (TELE) – 63° (WIDE),V: 1.5° (TELE) – 37° (WIDE)
   2) 4:3 aspect ratio H: 1.9° (TELE) – 46° (WIDE), V: 1.5° (TELE) – 37° (WIDE

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REVISION OF SECTION 614
TRAFFIC SURVEILLANCE CAMERA

Video

a) Compression Format H.264, JPEG
b) Image Resolution
   1) 16:9 aspect ratio (2 mega pixel mode)
      1,920 x 1,080 / 640 x 360 / 320 x 180 (30fps)
   2) 16:9 aspect ratio (1.3 mega pixel mode)
      1,280 x 720 / 640 x 360 / 320 x 180 (30fps)
   3) 4:3 aspect ratio (1.3 mega pixel mode)
      1,280 x 960 / 640 x 480 / 320 x 240 (30fps)
c) H.264
   1) Transmission Mode Constant bitrate / Frame rate priority / Best effort / Advanced VBR
   2) Frame Rate 1 / 3 / 5 / 7.5 / 10 / 12 / 15 / 20 / 30 fps
   3) Bit Rate/Client 64 / 128 / 256 / 384 / 512 / 768 / 1,024 / 1,536 / 2,048 / 3,072 / 4,096 / 6,144 / 8,192 kbps (depending on distribution mode.)
   4) Transmission type Unicast, Multicast
d) JPEG
   1) Image quality 10 steps
   2) Transmission type Pull, Push

Audio

a) Audio Compression G.726 (ADPCM) , G.711, AAC-LC
b) Audio Mode Off / Microphone input / Audio output / Interactive (Half duplex) / Interactive (Full duplex)

Operation

a) Super Dynamic Range On / Off
b) Adaptive Black Stretch On / Off
c) AGC On (LOW, MID, HIGH) / Off
d) Day & Night Day and Night functionality with a built-in IR-cut filter removal Off/ On/ Auto1 (Normal) / Auto2 (IR light) / Auto3 (SCC)
e) Digital Noise Reduction High / Low
f) Video Motion Detection 4 areas, Sensitivity:15 steps, Detection size:10 steps
g) Privacy Zone On/Off, up to 32 zones
h) VIQS Up to 2 zones
i) Camera Title (OSD)Up to 20 characters
j) Panning Range 360-degrees endless
k) Panning Speed
   1) Manual Approx. 0.065°/s to 120°/s, Up to 256 steps (depending on the controller)
   2) Preset Up to approx. 300°/s
l) Tilting Range -15° to 195°
m) Tilting Speed
   1) Manual Approx. 0.065°/s to 120°/s, Up to 256 steps
   2) Preset Up to approx. 300°/s

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REVISION OF SECTION 614
TRAFFIC SURVEILLANCE CAMERA

Network	
a) Network Interface	10Base-T / 100Base-TX, RJ-45 connector
b) IP	IPv6, IPv4
c) Supported Protocols	
1) IPv6	TCP/IP, UDP/IP, HTTP, HTTPS, RTP, RTSP, RTP/RTCP, FTP, SMTP, DNS, NTP, SNMP, DHCPv6, ICMP, ARP
2) IPv4	TCP/IP, UDP/IP, HTTP, HTTPS, RTSP, RTP, RTP/RTCP, FTP, SMTP, DHCP, DNS, DDNS, NTP, SNMP, UPnP, IGMP, ICMP, ARP
d) Max. User access	Up to 14 users
e) GUI Language	English,
Interface	
a) Monitor Output	VBS : 1.0 V [p-p] / 75 ohm, NTSC / PAL composite, BNC jack
b) Microphone	ø3.5 mm stereo mini jack
c) Audio Output	ø3.5 mm stereo mini jack
d) External I/O Terminals	ALARM IN 1 (DAY/NIGHT IN), ALARM IN 2 (ALARM OUT), ALARM IN 3 (AUX OUT)
e) SD memory card slot	1 slot, SD/SDHC/SDXC
Electrical	
a) Power Source	AC 24V, PoE+
b) Power Consumption	Approx. 55W (AC 24V), Approx. 25W (PoE+)
Safety /EMC	
a) Safety	UL (UL60950-1), C-UL (CAN/CSA C22.2 No.60950-1), CE, IEC60950-1
b) EMC	FCC (Part15 Class A), ICES-003 Class A, EN55022 Class B, EN55024
Mechanical	
a) Dimensions (D x H)	ø229 mm x 392 mm (ø9-1/32 x 15-7/16 inches) Diameter of the dome 160 mm (6-5/16 inched)
b) Weight	Approx. 5.0 kg (11.04 lbs.)
c) Construction material	
1) Main body	Aluminum die cast
2) Sunshields	ASA resin
3) Dome	Polycarbonate resin
d) Finish	
1) Main body	Natural silver
2) Sunshields	Natural silver
3) Dome	Clear
Environmental	
a) Vandal Resistance	IEC 62262 IK10
b) Ingress Resistance	IP66, IEC60529, Type 4X (UL50), NEMA 4X compliant
c) Operating Temperature	
1) AC24V	-50 °C ~ +55 °C (-58 °F ~ 131 °F)
2) PoE+	-30 °C ~ +55 °C (-22 °F ~ 131 °F)
d) Operating Humidity	10 % ~ 90 % (without condensation)

REVISION OF SECTION 627 and 713
PREFORMED THERMO-PLASTIC PAVEMENT MARKING

Section 627 of the Standard Specifications is hereby revised for this project as follows:

In subsection 627.09, first paragraph, delete the first sentence and replace with the following:

The markings shall consist of a resilient white, yellow, or other color thermoplastic product with glass beads and anti-skid elements uniformly distributed throughout the entire cross sectional area to ensure that skid resistance and retro-reflectivity is maximized.

Section 627 of the Standard Specifications is hereby revised for this project to include the following:

Subsection 627.09 (c) shall be added and shall include the following:

Inlaid (Word-Symbol) (X-walk/Stop-bar) (Shield)
All Preformed Thermo-Plastic Pavement Marking surfaces shall be ground before placement of proposed marking. Depth of grinding shall be such as to completely remove any existing pavement markings and to have a nominal depth of 125 mils +/- 10 mils. The inlaid area for the new Preformed Thermo-Plastic Pavement Marking shall be in the same shape or pattern as the Preformed Thermo-Plastic Pavement Marking that is being installed. Material thickness shall be 125 mils.

Surface shall be dry and free of dirt, dust, chemicals, and/or significant oily substances and cleaned with high pressure water blast or air blast. Existing pavement markings shall be removed prior to installation of preformed thermoplastic pavement marking in areas where markings overlap. Application procedures for portland concrete pavement shall be as described above except a compatible primer sealer shall be applied before application of marking to assure proper adhesion.

Marking shall be able to be applied at ambient and surface temperatures down to 32°F without any preheating of the pavement, special storage, preheating or treatment of the material before application.

The contractor shall require the stencil manufacture to provide on-site training prior to installation of the first stencil. All crew members on the work site shall be certified by the stencil manufacture. The training shall include surface preparation and stencil installation for both hot bituminous pavement and concrete pavement. The training shall be coordinated with and attended by CDOT project engineers and inspectors. Training shall be incidental to the work.

Section 713 of the Standard Specifications is hereby revised for this project as follows:

Subsection 713.14 shall be revised to include the following:

Marking shall be capable of conforming to pavement contours, breaks, and faults etc. Marking shall be capable of withstanding the actions of traffic at normal pavement temperatures. Marking shall have resealing characteristics such that it is capable of fusing with itself and previously applied thermoplastic pavement markings when heated with the torch.

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REVISION OF SECTION 627 and 713
PREFORMED THERMO-PLASTIC PAVEMENT MARKING

Material shall be composed of an ester modified resin, alkyd, or hydrocarbon based, resistant to degradation by motor fuels, lubricants, etc. in combination with aggregates, pigments, binders, and glass beads which have been factory produced as a finished product and meets the requirements of the current edition of the Manual on Uniform Traffic Control Devices for Streets and Highways. The thermoplastic material shall conform to AASHTO designation M249-79 (98).

Pigments shall contain sufficient titanium dioxide to ensure a color similar to Federal Highway White, Color No. 17886 and sufficient yellow pigment to ensure a color similar to Federal Highway Yellow, Color No. 13655 both conforming to Federal Standard 595. The yellow pigment shall be of an organic nature only and heavy metal free. Red and Blue material shall be manufactured with sufficient pigment to meet FHWA Docket No. FHWA-99-6190 Table 5 and Table 6 as revised and corrected.

The top surface of the stencils (the same side as the factory applied surface beads) shall have an indicator system for the contractor to properly gauge the correct amount of heat to apply during installation. The indicator system shall have a positive visual indication, such as beads changing color or indents closing together, when the material has reached the correct installation temperature. The indicator system must also provide a positive, visual indication if the material has not reached the correct installation temperature.

Marking, when applied in accordance with manufactures recommendations shall demonstrate a uniform level of sufficient night time retro-reflection when tested in accordance to ASTM E1710-97.

The surface of the preformed thermoplastic pavement marking with properly applied and embedded surface beads shall provide a minimum resistance value of 55 BPN when tested according to ASTME 303.

The material shall contain a minimum of thirty percent (30%) intermixed graded glass beads by weight. The intermixed beads shall be clear and transparent. Not more than twenty percent (20%) shall consist of irregular fused spheroids or silica. The index of refraction shall not be less than 1.50.

Marking shall have a factory applied coated surface of beads in addition to the intermixed beads at the rate of 1 lb. (± 10%) per 11 sq. ft. The factory applied coated surface beads shall have the following specifications:

a) Minimum 80% round
b) Minimum refractive index of 1.50.
c) Minimum SiO_2 content of 70%
d) Maximum iron content of 0.1%

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REVISION OF SECTION 627 and 713
PREFORMED THERMO-PLASTIC PAVEMENT MARKING

e)

Size Gradation	% Retained
14	0-3%
16	2-10%
18	10-30%
20	30-60%
30	50-80%
35	60-85%
45	95-100%
60	98-100%

Only preformed thermoplastic pavement marking material listed on the Department's approved products list may be used.

12. COVER MEP SYSTEM

12.1. General

12.1.1. The Developer is responsible for the design, installation, testing and commissioning of the mechanical, electrical and plumbing systems (MEP) for the Cover and the Lowered Section between Brighton Boulevard and Dahlia Street.

12.1.2. The Developer shall deliver the Cover MEP System to provide for the safe and efficient operation and maintenance of the I-70 Mainline so as to minimize risk to Users. For example, the likelihood of serious incidents may be reduced with adequate lighting, signing and traffic control systems and an Intelligent Transportation System (ITS). The severity of incident consequences may be mitigated through effective fire protection systems and procedures.

12.1.3. The Cover MEP System shall include:

a. The fire and life safety system, including:

i. Mechanical ventilation;

ii. A Fixed Firefighting System (FFFS) and associated water supply systems (required to limit the maximum reasonable design fire to that which is manageable by the longitudinal ventilation system);

iii. Fire Detection and Alarm Systems (FDAS);

iv. Emergency facilities including Emergency panels and fire hydrants;

v. Emergency signing; and

vi. Control systems required for system operation, monitoring, and control;

b. Pipework and Fixtures;

c. Ventilation;

d. ITS and Communications System;

e. Plant Rooms and Service Buildings;

f. Command Control and Monitoring System (CCMS);

g. Electrical Systems;

h. Lighting;

i. Standpipes, Hydrants and Portable Fire Extinguishers; and

j. Cover specific drainage system.

12.1.4. The fire and life safety system shall be designed and installed to:

a. Provide early detection of vehicle fire events in the Cover;

b. Facilitate rapid and effective operator response;

c. Instigate and manage effective self-rescue; and

d. Facilitate effective Fire Department intervention.

12.1.5. Individual system specifications provide minimum extents of systems/assets and are not intended to present prescriptive limits. The Developer's design solution and implementation methods may require interventions that exceed the stated minimum design requirements in order to comply with the applicable General Requirements and meet or exceed the applicable Targets for the Cover MEP System as specified in Schedule 11 Operations and Maintenance Requirements.

12.1.6. The Developer is solely responsible for the analyses, reports, design, drawings, detailing, clearances, manufacture, supply, coordination, installation, integration, commissioning, testing and operation of the systems. The Developer shall design the Cover MEP system to ensure functional

coordination and integration of all the individual systems. The Developer's Construction Work shall include all necessary incidental Activities, services and actions required to deliver a fully functional system that meets the requirements of the Project Agreement.

12.1.7. The Developer shall carry out an engineering analysis as required by NFPA 502, demonstrating full compliance with all requirements of this Section 12, and document such in a Fire System Performance Report submitted to the Department for Acceptance.

12.1.8. All equipment mounted in the Cover shall be mounted in such a way that it meets all design standards both in normal and Emergency use. This shall include measures such as mounting equipment outside of vertical clearance requirements on the Cover walls adjacent to I-70 Mainline or recessing all low-level equipment to not protrude into the horizontal clearance requirements.

12.1.9. The Developer shall provide emergency exit doors near each entry Portal to each bore and at a minimum one additional emergency exit door located within the Cover (spaced equally), which exit doors shall be for Fire Department use and meet the requirements of the National Fire Protection Association (NFPA) standard 502 subsection 716.5 and the subject requirements provided herein.

12.1.10. The Developer shall establish a Fire and Life Safety Committee (FLSC) consisting of the Department, the AHJ, and any other key Project participants and stakeholders with interest in fire protection, life safety, and emergency response planning. The Developer (with consultation from the other FLSC members) will develop guidelines/processes for operation of the FLSC.

12.2. Applicable Standards

12.2.1. The Cover MEP System shall be designed to comply with the Construction Standards. The requirements of the NFPA standard 502 and associated standards and specifications apply to the Cover and the Lowered Section on the approaches to the Cover. The Construction Work for the Cover is classified as *Category C* for fire protection and fire life safety purposes.

12.2.2. The requirements of the NFPA standard 502 and associated standards and specifications apply to the entire length of the Lowered Section, the limits being between Brighton Blvd. and Dahlia Street.

12.2.3. The Developer shall design, install, test, commission and put into operation the Cover MEP System in accordance with the Construction Standards and the requirements specified in this Section 12. The extent of the Cover MEP System shall include the whole of the Cover (including I-70 Mainline, Portals etc.), immediate approaches, all associated plant/equipment rooms and spaces, yards, interconnecting spaces (including pipes, ducts, cabling etc.), local and remote control centers etc., unless stated otherwise.

12.3. Durability

12.3.1. All equipment used in the Cover MEP System shall be protected against temperature range and atmospheric corrosion, including saline atmospheres. Materials used shall not be susceptible to mold growth, or attack by vermin or other life forms. All components shall have a minimum design life of 20 years.

12.3.2. All cable management systems (CMS) i.e. trunking, trays, conduit, brackets, enclosures etc. for equipment and ancillary items inside the bores of the Cover (including on the Portals and on the cross bore escape doors) shall be manufactured from grade 316L stainless steel or from nonmetallic phenolic resin, provided that stainless steel components shall be required for the western 25 feet measured from the west Portal over the eastbound lanes of the I-70 Mainline and the eastern 25 feet measured from the east Portal over the westbound lanes of the I-70 Mainline.

12.3.3. Enclosures shall have minimum penetration protection rating of IP66K in accordance with IEC 60529.

12.3.4. Enclosures shall have an impact resistance of IK09 in accordance with EN62262. Durable finishes shall be provided to all materials to resist mechanical stress due to moisture, traffic exhaust fumes, cover washers brush, cleaning detergents, etc.

12.3.5. Enclosures shall be designed to be free draining so that water does not 'pond' on any surfaces.

12.4. Pipework

12.4.1. The Developer shall use pipe work with anchor joints avoiding the use of concrete anchor or thrust blocks. However, additional anchoring or restraint shall be provided to the pipe work where required. The Developer shall consider the effects of surge within the fire and water distribution systems and shall provide a surge suppression system or devices to counter the effects of surge.

12.4.2. The water and fire mains shall be adequately insulated and trace heated where subject to freezing. The mains passing through the Cover shall be insulated and trace heated. Trace heating shall be monitored on the Developer's Command Control and Monitoring System (CCMS). Fire suppression distribution mains shall be insulated and trace heated up to the section control valve as directed by the system provider. Domestic water services within plant rooms shall be insulated and trace heated. Insulation shall be fire resistant and smoke retardant.

12.4.3. Pipework shall have electrical earth bonding.

12.4.4. Section isolation valves shall be provided at suitable locations and spacing along the Cover to facilitate inspection and maintenance Activities and automatic air release and drain valves shall be provided where necessary. These valves shall be monitored on the CCMS.

12.5. Fixtures

12.5.1. No fixture shall be made within two inches of the edge of a transverse movement joint in the Cover structure.

12.5.2. All fixings shall be Grade 316L stainless steel, with a grade appropriate to the environmental conditions in the Cover and the design life of a particular item of equipment to be supported.

12.5.3. All fixings shall be designed to withstand a temperature of 842ºF for a minimum period of one hour without loss of their design load carrying capacity. All fixings for equipment shall be designed so as to not overstress, damage or affect the performance or life of the structural fire protection system.

12.6. Electromagnetic Environment

The Developer shall ensure that any electrical and electronic equipment shall not be interfered with by, nor shall interfere with, any communications systems (including public radio and Emergency Services radio).

12.7. Cables

All cables shall be low smoke and fume and shall be suitable for its CMS in a Cover environment. Any cables exposed to daylight shall be ultraviolet resistant.

12.8. Training

The Developer shall provide operator and maintenance personnel training for each system prior to being put into use. This training shall include all aspects of operation, maintenance, configuration and future modification of the installation. The Developer shall provide training to the Department's staff who will be required to operate the I-70 Mainline and Cover MEP System in the event of the Developer's control room being unusable. The Developer shall provide in a suitable electronic format all training material and notes suitable for Department to train staff in the future. The Developer shall also develop suitable operator and maintenance personnel testing regime to ensure that all staff are trained and understand the systems to a competent level.

12.9. Special Tools

The Developer shall provide any special tools required to maintain the equipment, including licenses for any software required to maintain the system.

12.10. Cover Reference System

The Developer shall submit to the Department for Acceptance a common referencing system for the length of the Cover, for identifying position along the I-70 Mainline and for referencing within

asset registers. This shall be coordinated with the rest of the I-70 Mainline. This referencing system shall be clearly and indelibly marked within the Cover, using a method Accepted by the Department. The referencing system shall be coordinated with the Emergency response systems to ensure efficient identification of zones within the Cover during an Emergency for the purposes of operator response, system activation and Fire Department information.

12.11. Cover Design Baseline Report

The Developer shall submit a Final Cover Design Baseline Report, which is consistent with and expands upon the draft Cover Design Baseline Report submitted with the Proposal, to the Department for Acceptance in accordance with the Project Schedule. The Cover Design Baseline Report shall provide a system description that includes as a minimum the elements below, incorporating information on concept proposals, design criteria, performance, durability, maintenance requirements and spares:

a. System block diagrams for the overall CCMS, each cover subsystem, and any other systems or software that are related to the Cover operations;

b. Detailed logic and development plan for CCMS interfaces with other systems or software;

c. Proposed ventilation system type and supplier;

   i. Proposed ventilation design process; and

   ii. Approach to derivation of design adverse cover portal pressure condition due to the influence of meteorological conditions induced by a headwind at one Portal;

d. Proposed FFFS type and supplier;

e. FDAS type, model and supplier;

f. CCTV camera system type, model and supplier;

g. Operator interface system;

h. Monitoring and control system;

i. Proposed system operation, including temporary operation during construction;

j. Hydraulic and pneumatic calculations;

k. Computational Fluid Dynamics (CFD) analysis process, model, cases and assumptions;

l. Cover Ventilation System (CVS);

m. Proposed approach to demonstrating FFFS performance;

n. Analysis of the safety functions for all fire and life safety systems as prescribed in IEC61508-1;

o. Proposed approach to passive fire protection as prescribed in NFPA 502, Section 7.3;

p. Lighting;

q. Emergency way-finding signing;

r. ITS and communications system; and

s. Drainage.

12.12. Emergency Response Plan

12.12.1. The Developer shall prepare an Emergency Response Plan (ERP), as described in NFPA 502. The Developer shall conduct coordination meetings with the Department and stakeholders including City of Denver Fire Department, to discuss the details of the Cover MEP System operation and Emergency procedures. Such meetings shall be held at various stages of design development including draft and final stages. Additional stakeholders are to be determined by

CDOT and the AHJ. The ERP shall be submitted by the Developer to the Department for Acceptance at the same time as the Final Cover Design Baseline Report.

12.12.2. The Developer shall update the ERP and submit no later than 60 Calendar Days prior to opening of the Cover, or any part thereof, for Acceptance by the Department.

12.13. Ventilation

12.13.1. Scope

A Cover MEP System shall include a Cover Ventilation System (CVS). The scope of the CVS specification is limited to the ventilation of the Cover over I-70 Mainline only and excludes any plant room or service building ventilation systems.

12.13.2. System Requirements

The CVS shall be of longitudinal concept comprising jet fans. The system shall be developed for the following two principal operating modes:

a. Normal and congested operations: in situations where the traffic induced airflow is insufficient to maintain vehicle emitted pollutants to within acceptable levels, additional airflow will be generated by the ventilation system; and

b. Emergency operations: in the event of an Emergency incident, the ventilation system shall be operated to control the smoke and hot gasses and shall discharge the smoke and gases via the exit Portal.

12.13.3. Design Objectives

The CVS shall be designed to meet the following objectives:

a. To provide sufficient capacity for adequate pollution control in the Cover over the I-70 Mainline during normal and congested traffic conditions;

b. To provide sufficient ventilation to maintain tenable conditions in the Cover over the I-70 Mainline for the evacuation of Users during a design fire; and

c. Maintain reasonable conditions for the intervention and rescue operations of the Fire Department.

12.13.4. Design Criteria

a. Normal and congested operations

i. The CVS shall provide air flow to induce sufficient outside air into the Cover to ensure acceptable levels of vehicle emission contaminants are maintained throughout.

ii. The permissible exposure limits for each bore shall be in accordance with Environmental Protection Agency and FHWA standards. Maximum limit levels for normal traffic operations are given in Table 12-1 below:

Table 12-1 Maximum Pollutant Levels

Pollutant	Maximum Limit
Carbon Monoxide, CO	120 ppm
Nitrogen Dioxide, NO_2	1 ppm
Nitric Oxide, NO	15 ppm
Particulate Matter, PM	0.007 m^{-1} extinction coefficient

b. Emergency Operations

i. The CVS shall be designed such that, in the event of fire during normal, free-flow unidirectional traffic conditions, the system shall induce airflow in the incident bore that moves smoke and hot gases towards the exit Portal, maintaining tenable conditions for self-rescue. Emergency Service intervention will be via a route upstream of the fire event.

ii. The Cover and approach/exit highways sections shall be designed to facilitate the rapid clearance of traffic from the Cover downstream of any incident. In the case of a fire during congested unidirectional traffic (i.e. where traffic may be stationary both sides of a vehicle fire), the Developer shall develop operational procedures and a ventilation response, as part of the Fire System Performance Report, to provide the best conditions for escape within the constraints of the CVS design for normal, free-flowing unidirectional traffic. The non-incident bore can be assumed to be operationally available for evacuation.

iii. The design fire size for the Cover MEP System shall be 30 MW convective peak heat release rate, as documented in the Reference Documents on design fire Size. The CVS is required to be capable of generating at least the critical velocity for smoke control for the design fire at the worst-case location in the Cover during an adverse Portal pressure condition.

iv. The CVS shall be designed to minimize recirculation of smoke from the incident bore to the non-incident bore during an Emergency.

v. The CVS shall be designed to meet the air flow requirements with the cross connecting doors between the bores open during evacuation.

12.13.5. Noise

a. Noise levels in the Cover, under full operation of the CVS, shall account for any specific requirements of the Fire Department and not be so high as to interfere with the use of Emergency communications systems. The maximum level as defined in NFPA 502 shall not be exceeded.

b. Noise levels in the Cover under normal operations of the mechanical ventilation system shall be in compliance with the Local Agency noise ordinances.

12.13.6. Ambient conditions

The Developer shall base the CVS design on the following ambient conditions:

a. Ambient temperature of 100°F;

b. Local elevation of 5250 ft.; and

c. Adverse Cover Portal pressure condition representative of a credible worst case headwind defined as the headwind not exceeded 5% of the time.

12.13.7. Jet fans

a. The jet fans shall be of the horizontal shaft unidirectional type complete with silencers with bell mouth on both ends of the jet fan and shall fit outside of the headroom and width clearances. The mounting of jet fans parallel or inclined to the roadway surface shall be taken into account in their selection, design and manufacture. The jet fans may be inclined, fitted with adjustable air flow directors or fixed deflectors for setting the optimum jet effect.

b. Each jet fan unit shall be capable of producing a minimum design thrust to meet the specified design criteria under local worst case atmospheric conditions. The thrust developed per power of motor input power shall be taken as an assessment of the fan efficiency.

c. The complete jet fan assembly, including but not limited to the fan, fan motor and cables shall be capable of operating in the ambient temperature during normal operation.

d. Anti-vibration mountings shall be provided to reduce the transmission of vibrations, at frequencies associated with the fan running speeds and their first three multiples (harmonics), to levels that are acceptable for transmission of noise and vibration through the structure.

e. Jet fans shall be equipped with vibration monitors to enable the transmission of vibration levels to the CCMS. The CCMS shall be programmed to provide an alarm indication when the level of vibration exceeds that specified by the manufacturer. The design shall be such that under Emergency operations any vibration alarms shall be inhibited and shall not result in the switching off of a jet fan.

f. Jet fans shall be equipped with motor temperature monitors to enable the transmission of temperature levels to the CCMS. The CCMS shall be programmed to provide an alarm indication when the level of motor temperature exceeds that specified by the manufacturer. The design shall be such that under Emergency operations any motor temperature alarms shall be inhibited and shall not result in the switching off of a jet fan.

g. The complete fan assembly, including but not limited to the fan, fan motor and cables, shall be designed and installed such that it not suffer mechanical, electrical or structural failure when operating at full capacity in smoke laden air with an ambient temperature of 482°F for a minimum period of one hour. The Developer shall include a manufacturer's type test certificate showing that the design meets these requirements as part of its design submittal.

h. The whole fan assembly shall be waterproof and capable of withstanding water spray from maintenance washing vehicles and the FFFS. A drain fitting with cap shall be located in the lowest part of the fan housing, if not self-draining by manufacturers design.

12.13.8. Jet fan motors

The jet fan motors shall conform to the following requirements:

a. Suitable for use in the corrosive atmosphere;

b. Suitable for use with soft starters;

c. Be totally enclosed fan ventilated cage rotor type;

d. Protected motor enclosure;

e. Lifting lugs or eyes shall be provided; and

f. Capable of being run in an inclined position, not greater than 15° from the horizontal with no detrimental effects.

12.13.9. Ventilation Control System

A ventilation control system (VCS) for the CVS shall be integrated into the CCMS to:

a. Permit interface between the operator and CVS equipment components;

b. Provide automatic ventilation control in normal operations, ensuring the Cover is maintained within required environmental conditions that can be adjusted when required;

c. Operate in real time to provide live monitoring, control and fault reporting of the CVS equipment;

d. Provide real time indication of status and alarm conditions at various operator locations;

e. Interface with and provide data transfer between related systems;

f. Provide a secure interface between the CVS equipment and the automatic incident detection (AID)/fire detection systems in the event of fire in the Cover; and

g. Minimize effects and constraints on tunnel operations through automatic reconfiguration modes in the event of plant failure or routine maintenance activities.

12.13.10. Monitoring Equipment and System

Subject to Section 1(h) of Part B of Schedule 28 (*Proposal Extracts*), monitoring equipment shall be provided for the continuous monitoring of Visibility, CO, NO_2, air speed, air flow direction and temperature in the Cover and:

a. For pollution monitoring, a logical method for control shall be developed for normal, maintenance and congested operations and safeguard the fans from frequent switching;

b. Pollutant and visibility monitors shall be located adjacent to the traffic lanes in the Cover, at locations where the worst level is anticipated;

c. All monitoring equipment shall be calibrated to represent the average air quality within the Cover;

d. Monitoring system shall be provided to facilitate operational data to be recorded and stored for analysis. Data to be recorded shall include pollution levels, Cover air speed, fan operations and alarm states;

e. For the measurement of pollutants, at least two sampling points shall be provided at each side of the each bore of the Cover (eight in total). The location of sampling points shall avoid dilution by air circulating from the Portals;

f. Monitoring stations shall be located and configured so as to provide data to drive the VCS for the management of pollutants in the Cover to acceptable limits;

g. Monitoring equipment shall not be installed near to jet fan inlets and outlets so as to affect the performance of the CVS; and

h. Six air speed and direction monitors shall be installed: two in each bore of the Cover to provide information to the operator on the flow speed and direction of air inside the Cover and two outside the Cover near to each Portal at a location suitable to provide information on external ambient wind conditions to the operator. Proposed locations shall be detailed in the Developer's Fire System Performance Report.

12.13.11. Interfaces to Other Systems

a. Command, Control and Monitoring System

The CCMS shall read and display the status and settings of all fans and control equipment. The operator shall be able to control the ventilation on a per bore basis using a series of pre-configured plans on the CCMS.

b. Fixed Fire Fighting System

The CVS shall work in tandem with FFFS. The CVS shall be designed to be operated in a way that minimizes the impact on the effectiveness of the FFFS.

c. Fire Detection and Alarm System

The CVS shall interface to the fire detection and alarm system (FDAS) to determine the location of any active fire detections.

d. Pollution Monitoring System

The VCS shall interface with the pollution monitoring system via the CCMS, so that ventilation rates in the Cover can be set automatically, according to dilution requirements.

12.13.12. Computational Fluid Dynamics Model

a. As part of the Fire System Performance Report, effective performance in operation of the combined FFFS and the CVS shall be demonstrated through analysis with a CFD model and comparison to data from full scale fire tests and other data relevant to the proposed

design. Should reasonable testing, data and performance be provided for the Developer's proposed design, new full scale fire tests are not a requirement. The CFD modeling shall be coordinated closely with and fully demonstrate the performance of the Developer's proposed design to the complete satisfaction of the AHJ.

b. The CFD model shall be validated for the proposed performance of the CVS and FFFS considering ambient conditions listed in Section 12.13.6.

12.13.13. Ventilation System Design

Information on ventilation system performance requirements, design criteria and the demonstration of how the design meets the requirements for Emergency operation, as described in this Section 12.13, shall be placed in the Fire System Performance Report.

12.14. Fixed Firefighting System

12.14.1. Scope

The Developer shall design and install the FFFS to serve the full length of both bores of the Cover. The FFFS shall be designed to achieve the following objectives in the event of a vehicle fire in the Cover:

a. To control the fire and limit peak heat release rate and smoke production;

b. To reduce temperatures in the vicinity of the fire to aid self-rescue operations;

c. To reduce temperatures in the vicinity of the fire to reduce likelihood of fire spread; and

d. To maintain conditions that are reasonable for Fire Department intervention.

12.14.2. Basis of Design

The Developer shall design, provide, install, test and commission the FFFS in accordance with the Construction Standards and the requirements of the Authority Having Jurisdiction (AHJ). The Developer shall provide advance notification of FFFS performance testing and complete demonstrations to the Department and the AHJ. The Developer shall undertake all necessary surveys and investigations to validate its design including, but not limited to Utility surveys, investigations, inquiries with relevant Governmental Authorities and for obtaining all Governmental Approvals.

12.14.3. Design Criteria

a. A key design objective for the FFFS is to suppress a fire of potential to grow to 120 MW to an extent that provides conditions suitable for effective self-rescue and reasonable conditions for fire service intervention and for those Users unable/unwilling to self-rescue until assistance is provided.

b. Booster pumps or other means shall be provided to supply the FFFS and shall be maintained at required flow and pressures.

c. The FFFS shall be designed so as to limit the maximum heat release rate to be handled by the CVS to 30 MW convective heat release rate. The design case to be considered shall be of a heavy goods truck with an ultrafast fire growth rate according to NFPA 92 up to a maximum of 120 MW.

d. The time period between a fire ignition to fire detection shall be based on the performance characteristics of the FDAS. The performance of the FDAS shall be validated through full scale testing.

e. The representative timeline of a design fire scenario, including characterization of the design fire, fire growth, fire detection, activation of Cover fire safety systems, self-rescue and Fire Department intervention shall be presented in the Fire System Performance Report.

f. The Developer's designer shall be licensed. The installation and certification shall be carried out by certified contractors.

12.14.4. FFFS Requirements

The entire Cover shall be protected by the FFFS, which shall be zoned and shall comprise:

a. Water supply provision in accordance with NFPA and Fire Department requirements;

b. Pumps and controls;

c. Wet main distribution pipework from the local water system, to pump room and routed into and along the walls in the Cover near the soffit level;

d. Section valves to create suppression zones with a minimum section length of 100 feet in length (at least two zones are activated during a fire equating to a protected area of at least 200 feet in length);

e. Dry secondary distribution pipework at high (soffit) level of the structure to feed the suppression nozzles above the traffic lanes; and

f. Suppression nozzles connected to the secondary distribution network; the number of nozzles across the Cover width and nozzle banks shall be longitudinally spaced to provide sufficient and homogeneous flow pattern distribution in the area to be protected.

12.14.5. Fire Detection and Alarm System

The Developer shall install an automatic FDAS in accordance with the provisions in NFPA 72, including fire alarm control panels. The FDAS shall be capable of locating a vehicle fire to within a longitudinal distance of 25% of the length of a single FFFS zone. The FDAS shall be integrated with the FFFS and the CVS to ensure effective and timely response to fire to meet the performance requirements for the FFFS and other safety systems.

12.14.6. Water Supply

a. The Developer shall design, install and commission a water supply system to provide water supply for the FFFS. The water demand for the FFFS shall be sized based upon a minimum demand of 30 minutes of simultaneous operation for two zones in the event of a fire.

b. The water supply shall be adequate to provide water at the minimum working pressure required by the FFFS. Under dynamic full fire flow conditions, all locations within the system shall be demonstrated to have adequate pressure for the FFFS. Operation of the FFFS shall not reduce the operating pressure or flow rate of the Cover standpipe system and vice versa.

c. The Developer shall be responsible for arranging the source of the FFFS water supply, which shall be (i) direct mains supply from the local/municipal water company, (ii) capable of supplying the system minimum demand at the most disadvantageous location for the pipeline system for the required period and (iii) at a water quality that complies with the manufacturer's requirements.

12.14.7. Pumping System

a. The FFFS shall be equipped with pump station to be located in a designated pump room.

b. Pump units shall consist of one or more pumps and driven by electrical motors. The electrical power supply shall be dual redundant with automatic switch over. The electrical power supply shall comply with the Construction Standards.

c. Pump sets shall be arranged with at least one pump available as a standby in the event of a duty pump failing.

d. The pump station shall be capable of delivering 110% of the full design flow rate demanded by the FFFS at the required system pressure to supply the protected area - the two spray zones within the Cover - at the minimum pressure specific to the nozzle.

e. Hydraulic and pneumatic calculations submitted with the Cover Design Baseline Report shall:

   i. Apply only appropriate and validated calculation procedures for pressure loss calculations (i.e. the formulae of Darcy-Weisbach for liquid flow systems);

   ii. Include provision for the elimination of the effects of surge and water hammer effects in section valves and the pipework system as a whole;

   iii. Provide assurance that the pumped flows are acceptable in terms of flow rate and pressure at each nozzle location with full system deployment; and

   iv. Provide pump and system characteristics curves. In addition performance curves shall be provided indicating the efficiency and power requirements including the operating range.

f. The following equipment/fittings shall be provided as minimum within the pump station:

   i. Isolating valves;

   ii. Safety valves for each pump set at 115% of the operating pump pressure;

   iii. Diverter valves;

   iv. Manifolds;

   v. Filters to be 100% redundant or self-cleaning and provide a by-pass for blockages;

   vi. Flow meters;

   vii. Pressure gauges;

   viii. Controls; and

   ix. Surge prevention devices.

g. Water treatment shall be provided where required subject to water quality analysis and suitability for the Developer's system.

h. Pump rooms shall be kept at a temperature above 39°F at all times in order to prevent freezing. Rooms shall be equipped with a suitable drainage and ventilation system.

i. A jockey pump or an equivalent of such pump shall be used to pressurize the main pipe to a suitable stand-by pressure up to the section valves (wet pipes). Provision of non-return valve between the pump and the pipes as well as test valve at the pump outlet shall be also provided.

12.14.8. Pipeline System

a. The pipework shall be dimensioned to ensure that the minimum pressure tested is achieved at all nozzles of the activated sections. The maximum allowable pressure loss shall be within the limits given by the maximum and minimum tested pressure.

b. The Cover Design Baseline Report shall include a Hardy-Cross or similar pipe network analysis performed for a variety of flow scenarios to identify the maximum and minimum dynamic pressures in the system when operated in various hydraulically remote states. This analysis shall identify the maximum flow velocities expected within the pipe, to ensure that the pipe hanging system is adequate to resist the bend forces expected in the pipe network. Pressure surge mitigation shall be sized to safely handle water hammers expected during the transient operation of the system when various remotely located valves are closed. Where necessary, the Developer shall incorporate into the structural design, any strengthening necessary to eliminate any overstress. Sleeves shall be cast in the hole and the annulus between pipe and the sleeve shall be suitably fire stopped.

c. The Cover shall be equipped with a main pressure line feeding through section valves into individual zones and associated nozzle arrays.

d. Pipe material shall be tolerant against corrosion. Adequate support shall be provided for all exposed pipework, nozzles and valves to:

i. Prevent undue stresses being imposed on them during operation and while joints are uncoupled for maintenance purposes;

ii. Comply with expected levels of load, vibration, water hammer, air velocities and heat resistance; and

iii. Minimize the effect of high vehicle impact against nozzles and pipework.

e. The wet sections of the pipework shall be maintained at a minimum temperature of 39°F at all times, so the design shall include provisions to guarantee this minimum temperature requirement (e.g. insulation and trace heating).

f. Filters and strainers shall be provided to pipelines that lead water to the pump station to avoid any particles entering the pumps, hence blocking the distribution system.

12.14.9. Valves

a. All valves constituting the FFFS shall be provided with means of monitoring status which shall be reported to the CCMS. Section valves shall be robust, remotely controlled and fully leakage free.

b. Valve enclosure boxes shall be fire resistant and provide sufficient resistance to permit continuous and full functioning of valves for a minimum period of two hours with the fire suppression system operating, taking into consideration the anticipated air temperature immediately outside the enclosure during the design fire of 30 MW.

c. Fire resistant valve enclosure dimensions shall be minimized to reduce any risk of traffic collision.

d. Adequate support shall be provided to the section valves to withstand the expected air velocities in the Cover.

12.14.10. Nozzles

a. Nozzle installation shall be at high level (soffit) in the Cover.

b. The nozzle design shall allow for the expected ventilation velocities of the longitudinal ventilation system and shall be designed to deliver water droplets appropriate to meet the fire performance acceptance for the design fire.

c. All nozzle openings shall be designed for protection against contamination and clogging.

d. All nozzles shall be installed in full accordance with the manufacturer's design and installation manual taking into account: positioning, distance from walls and other obstructions, orientation and Site hazards.

12.14.11. Local Control Facilities

a. The Developer shall provide the following facilities in a protected room near the entry Portal to each bore for Fire Department use:

i. Fire main manual wheel valve to allow the dry standpipe hydrant main to be filled from the water supply (automated control to be provided as a backup);

ii. Control panel with override facilities and status indicators for the FFFS;

iii. Control panel with direct override facilities and status indicators for the ventilation system;

iv. Fire alarm control panel;

v. Fire Department hose connections to connect sufficient hoses to supplement FFFS should supply fail;

vi. Radio coverage repeater; and

vii. Sufficient heating and ventilation to avoid condensation or corrosion as well as lighting.

b. All equipment shall be housed within sealed IP66 enclosures.

c. The protected rooms shall be provided in accordance with local codes and standards.

12.14.12. Electrical Equipment

a. Power supply for the pumps shall be provided from low voltage distribution boards. Control panels shall be provided at the pump locations. Local controls shall be provided to operate pumps individually from the pump locations.

b. All power and control cabling shall be sized correctly taking into account the full load current of the plant, characteristics of the protection devices and voltage drop.

c. Pumping equipment and section valves shall be instrumented to enable remote monitoring of mode and condition to the CCMS.

12.14.13. Control System

The control system shall:

a. Secure interface between the operators and the fire suppression plant;

b. Provide real time indication of status and alarm conditions at various operator locations;

c. Interface with and data transfer between related systems;

d. The FFFS control system shall be integrated with the CVS via CCMS;

e. Be scalable and have flexibility for future changes in operational modes;

f. Operate in real time to provide live monitoring, control and fault reporting of the plant services;

g. Faults and alarms shall be reported to the CCMS;

h. Provide operator access without the need for computer programming skills to carry out the day to day functions;

i. Provide the option of manual override if the Cover MEP System operator deems necessary; and

j. Provide a manual backup at the pump station for independent control of the pumping plant.

12.14.14. Interfaces

a. Ventilation System

Effective performance in operation of the combined FFFS and the CVS shall be demonstrated through analysis with a CFD model as described in this Section 12. The results shall be included in the Fire System Performance Report.

b. Command, Control and Monitoring System

The design shall facilitate the FFFS status, settings and faults to be reported to the CCMS including: Pump and valve system status.

c. Fire Detection and Alarm System

The CCMS shall provide a secure interface between the FFFS and AID system in the event of fire in the Cover to determine the location of any active fire zone.

12.15. ITS and Communications System

12.15.1. This Section 12.15 describes all ITS and communications system requirements of the Cover MEP System. The Developer shall incorporate and fully integrate into the Construction Work these requirements, herein after referred to as Cover ITS, with the Project ITS requirements identified in Schedule 10, Section 3, ITS and Tolling Equipment.

12.15.2. The Developer shall operate the Cover from the CTMC and provide all the necessary equipment and staff to safely operate the Cover. The Developer shall provide a backup control center for the Cover at or near the Cover. The backup control center shall be provided with all the necessary facilities and equipment to control the Cover in the event of being unable to control from the CTMC and to provide facilities to manage emergencies. A briefing room and restroom shall also be provided. All the systems shall be designed to an appropriate level of resilience and redundancy in accordance with IEC61508.

12.15.3. The Developer shall provide communications links to the Fire Department for fire alarms.

12.15.4. Communication System

a. The Developer shall provide a communication system for the Cover to inform the Users, members of the public, the Emergency Services and the Department. The communication system shall comprise the following four sub-systems:

i. Emergency roadside telephones;

ii. Radio Rebroadcast;

iii. Voice Alarm (VA)/Public Address (PA); and

iv. Emergency way-finding signage.

b. The four subsystems will provide the following facilities:

i. Emergency Roadside Telephones

Emergency roadside telephones shall be provided in the Cover and on its immediate approaches in both directions. The telephones shall be connected directly to the CTMC and the backup control center operator's desks.

ii. Radio Rebroadcast

A. The radio rebroadcast shall be in accordance with NFPA 72 and:

(I) Allow the Emergency Services personnel to communicate by radio with their commanders and one another while inside the Cover;

(II) Allow operations and maintenance staff to communicate by radio with their operations center and with one another while in the Cover;

(III) Allow Users to receive domestic radio broadcasts using their in-car radios. These radio broadcasts shall be processed within the Cover roadway management system to allow the broadcast program to be interrupted and replaced with an appropriate Emergency public safety message; and

(IV) Allow all Users in the Cover to make and receive cellular telephone calls.

B. The radio rebroadcast systems shall meet all local, State and Federal Law and standards relating to the transmission of radio services and the Developer shall negotiate and obtain all necessary licenses. Any apparatus emitting radio energy shall be specified and supplied to ensure that there is no interference to any radio or other electronic services outside the Cover.

iii. Voice Alarm/Public Address

A. The voice alarm and public address VA/PA system shall be designed and installed in accordance with NFPA 72 and shall allow Cover operations staff to make Emergency public safety announcements in the Cover and on its immediate approaches. The VA/PA system shall reproduce sound such that clear and intelligible speech can be heard by members of the public at all points in the Cover and within twenty-five feet of the Portal under all conditions of background noise likely to be experienced (e.g. with or without the CVS running and with or without traffic flowing).

B. The functionality and priority of the system shall be determined during detailed design. It shall be possible for the list of available messages and the priority level of that message when selected by the operator to be changed by any suitably accredited system operator.

iv. Emergency Way-Finding Signing

In order to aid the evacuation of Users in the event of an incident in the Cover, internally illuminated Emergency way-finding signs will be provided. Each of the signs shall have two faces with the sign on one face pointing to the entrance Portal and the sign on the second face pointing to the exit Portal. The internal illumination of these signs shall be controlled from the Cover Control Center such that in the event of an incident only the signs that show a safe route shall be illuminated at any time. The Emergency way-finding signs shall otherwise always be illuminated.

12.15.5. Data Communication System

The Developer shall design and install a data communication system to provide and facilitate a reliable, high bandwidth fault tolerant communications to all equipment throughout the Cover and its immediate approaches. It shall be integrated with the Project's ITS infrastructure to provide reliable communications to the Control Centers. It is anticipated that this will be provided by means of a single high reliability fiber-optic based Ethernet network. Fault tolerance shall be provided by means such as a 'self-healing' ring network topology or Ethernet Ring Protection Switching (ERPS).

The Developer shall provide a minimum of a 96 strand fiber optic cable, separate from the ITS backbone cable. All Cover system devices shall be spliced to this 96 strand fiber optic cable. Two strands in each direction on the ITS backbone will be utilized to provide physically diverse communication paths between the Cover and the CTMC. The Developer shall provide redundant communications paths utilizing the ITS backbone installed as a part of the Project. The Developer shall also utilize existing CDOT ITS fiber paths to the east on I-70, south on I-225 and north on I-25 to the Southmoor Node; and west along I-70 to Node 2, via Node 1. The Developer shall complete backbone connections on existing CDOT ITS fiber paths, per design and construction requirements as outlined in Schedule 10, Section 3, ITS and Tolling Equipment. The Developer shall perform all off-corridor splicing and provide communications equipment necessary to light the fiber path and enable communications.

The Developer shall be responsible to install any fiber, networking equipment or connections at the Cover, Southmoor Node, CTMC and any other locations necessary to establish the required physically diverse communications paths between the Cover and the CTMC. The Developer will utilize CDOT's network for the communications link between the Cover and the CTMC.

The Department will install a firewall at the Cover, which will serve as the demarcation point between the Developer's network and CDOT's network.

Critical equipment shall be provided with IP connections to two different (redundant) Ethernet switches and all Ethernet switches shall be resistant to the effects of MAC address 'flapping' and broadcast storms. The Developer shall ensure security of his systems and those connected to it (including but not limited to the Department's ITS system) in accordance with ISO 27001. All Ethernet switches shall be manufactured by Ciena, using the same field and aggregation switch

types as required per Schedule 10, Section 3, ITS and Tolling Equipment, unless otherwise approved by the Department.

The fiber optic design, Network and Splicing Plan and associated testing, related to the Developer's fiber and network, shall be designed and submitted for review according to Schedule 10, Section 3 unless otherwise approved by the Department.

The Developer shall provide continuous DSRC communications within the Cover section as required per Schedule 10, Section 3 – ITS and Tolling Equipment.

12.15.6. Lane-Use Signals

a. The Cover ITS shall include lane-use signals (LUS) mounted on gantries at the entry Portal of each bore. These Portal LUS shall be an Element of the Project ITS requirements. The system design shall include complete integration of the LUS into the CTMS software, and a direct field interface to the LUS from the CCMS to override normal LUS operations per Schedule 10, Section 12.17.

b. Portal LUS shall be of same model, manufacture and type as the ATM LUS specified in Schedule 10, Section 3 – ITS and Tolling Equipment.

12.15.7. Dynamic Message Signs

a. Dynamic Message Signs (DMS) shall be provided at both entry Portals of the Cover as an Element of the Project ITS requirements. The DMS shall be full-color, full-matrix signs with dimensions of 18 feet wide, 8.5 feet tall, and 4 feet deep. The DMS shall be as specified in Revision of Section 614 – Dynamic Message Sign (Color LED)(Overhead) in Schedule 10, Section 3 – ITS and Tolling Equipment Appendix B. DMS shall be capable of displaying messages with wording or graphics as Approved by the Department at the design stage. The DMS shall be used to inform drivers of full or partial Closure of the I-70 Mainline in the Cover or more generally of conditions ahead.

b. The system design shall include complete integration of the DMS into the CTMS software, and a direct field interface to the DMS from the CCMS to override normal DMS operations per Schedule 10, Section 12.17.

12.15.8. Closed Circuit Television

a. The Developer shall provide pan, tilt and zoom Closed Circuit Television (CCTV) cameras with integrated wash/wipe functionality and associated transmission equipment in the Cover and on its immediate approaches. The CCTV cameras shall be integrated directly into the AID/CCMS for primary operational monitoring, where they shall have recording capability. Recordings from all CCTV cameras shall be made and retained for a minimum duration of 30 Calendar Days to allow for the analysis of any incidents that might have taken place before being overwritten (unless specifically marked for retention by an operator).

b. The Developer shall provide a sufficient number of cameras to ensure that 100% coverage within the Cover and its immediate approaches is achieved with all cameras in their 'home' position with minimal blind spots, as approved by the AHJ. Cameras shall be mounted over the running lanes in groups of three, the middle camera of each group shall be a thermal camera. One shall be over the ramp lane, one over the center of general purpose lanes and one over the Tolled Express Lane.

c. Access to the CCTV cameras shall also be provided to the Department for integration into CDOT's video management system. Developer shall be responsible for integrating the cameras into the AID/CCMS and the Department will be responsible for integrating the cameras into CDOT's video management system. Developer shall provide a Nice (Qognify) software video recorder server at the CTMC for the Department, and all CCTV cameras installed in the Cover shall meet the requirements of Schedule 10, Section 3.7.3.

d. Pan, tilt, zoom and wash/wipe controls of the CCTV cameras are to be provided for both the AID/CCMS and CDOT's video management system.

12.15.9. Ramp Meter System interface

The CCMS shall have a direct field interface to the ramp meter at the westbound Vasquez Blvd. entrance ramp. This interface shall permit the CCMS to override normal ramp meter operations per Schedule 10, Section 12.17.

12.15.10. Automatic Incident Detection System

The Developer shall provide an Automatic Incident Detection (AID) system within the Cover and its immediate approaches. The detection system shall provide the following facilities:

a. Traffic speed and flow data (traffic speed and flow data shall also be integrated into the CTMS software);

b. Detection and alarm for a single stationary vehicle in the Cover;

c. Detection and alarm for congested traffic flow in the Cover;

d. Detection and alarm for congested traffic flow downstream of the Cover; and

e. Detection and alarm for a vehicle travelling in the wrong direction within or approaching the Cover.

f. Automatically control PTZ for the nearest upstream and downstream camera to focus on any incident alarm received by the CCMS software. Any workstations running the CCMS software shall automatically bring up the applicable video feed(s), based on user-selected alarm priorities.

12.15.11. The Developer shall monitor the AID system performance during use and at regular intervals 'tune' the system to minimize false alarms whilst ensuring that real alarms are correctly detected. The Developer shall on an annual basis repeat the commissioning tests to demonstrate that the original performance of the system is being maintained and submit the test results to the Department for Acceptance.

12.15.12. Information on how the Cover ITS and communications systems are to be operated in an Emergency with demonstration of how the design facilitates effective self-rescue and Fire Department intervention shall be placed in the Fire System Performance Report.

12.16. Plant Rooms and Service Buildings

The Developer shall provide suitable plant rooms to house network equipment, control equipment and associated equipment meeting Local Agency building codes and standards. All plant rooms and service buildings shall include HVAC, lighting, environmental monitoring, intruder alarms, fire alarms, FFFS and other required systems.

Plant rooms and other Cover facilities, including the backup control room and the room housing the CCMS server(s), shall have secure access utilizing the same environmental monitoring and access control systems that CDOT uses on its node buildings; refer to Schedule 10, Section 3 – ITS and Tolling Equipment: Traffic Management System Building and Traffic Management System Building Equipment specifications for requirements.

The I-70 Cover Plans in Schedule 10B Contract Drawings indicate locations (labelled 'Maintenance Building') and footprints on the Cover for two service buildings (one at each bookend). The Developer (i) is required to construct any such buildings that it requires in accordance with its design at such locations, (ii) is not permitted to construct such buildings using a greater footprint than indicated in such plans unless Approved by the Department to be larger and (iii) notwithstanding (ii), shall minimize the sizes of such buildings by locating certain plant rooms and equipment in separate facilities located within remaining ROW areas in the vicinity of the Cover or in Additional ROW areas.

12.17. Command Control and Monitoring System

12.17.1. Scope

a. The Developer shall design and install a CCMS to provide a comprehensive fault monitoring and management facility for all electrical and mechanical systems installed in the Cover as well as to facilitate the operation and management of the roadway in the Cover and its approaches. The CCMS design shall include provisions to integrate the ITS described in this Section as necessary to support the CCMS, and to enable the CCMS to override additional Project ITS devices as necessary in emergency conditions.

b. The CCMS shall include the ability to monitor the status of the entire Cover MEP System, including all sensors and alarms, and provide facilities to:

i. Override the automatic operation of the CVS;

ii. Override the automatic operation of the drainage system;

iii. Override the automatic operation of the power distribution system;

iv. Override the automatic operation of the lighting system;

v. Override the automatic operation of the Emergency way-finding signs;

vi. Override the automatic operation of the FFFS;

vii. Override the automatic operation of the Portal LUS, Portal DMS and the ramp meter at the westbound Vasquez Blvd. entrance ramp during emergency conditions;

viii. Control the operation of the radio rebroadcast systems;

ix. Control the operation of the voice alarm and public address system;

x. Monitor the status of the fire main system;

xi. Monitor the status and manage alarms from the AID system;

xii. Monitor the status and manage alarms from the FDAS;

xiii. Monitor the status and manage alarms from the cross bore doors, emergency panels and emergency phones;

xiv. Monitor Plant Room systems including heating, ventilation, and air conditioning (HVAC), lighting, intruder alarm, fire alarm, FFFS etc.;

xv. Monitor the status and manage alarms from all environmental and other sensors;

xvi. Monitor the status of the power distribution system; and

xvii. Request, via an appropriate interface, specific actions from the traffic management systems (including automatic responses to state changes and alarms from the systems being monitored).

c. The CCMS shall be integrated with the Project ITS to allow the operators to manage and coordinate the operation of the I-70 Mainline in the Cover and along both approaches. The Developer shall be responsible for any integration necessary, including any required CCMS software, communications systems or field hardware development. These include:

i. LUS at the Portals;

ii. DMS near the Portals;

iii. Communications Systems;

iv. CCTV within the Cover and at the Portals;

v. Ramp meter at the westbound Vasquez Blvd. entrance ramp; and

vi. AID system.

d. The CCMS shall be based upon a programmable logic controller (PLC) based Supervisory Control and Data Acquisition (SCADA) system. Interfaces to systems both in the Cover and on the surface streets may be required.

e. The Developer shall provide Cover operations staff to continuously monitor and control the Cover MEP System. Such staff shall:

i. Be co-located with CDOT ITS staff at the CTMC;

ii. Be responsible for the remote control and monitoring of the Cover MEP System; and

iii. Assist with Courtesy Patrol dispatch, general traffic, roadway, weather, construction and Special Event management, ATM, and Tolled Express Lane system monitoring and operations.

f. All information and alarms provided by system elements monitored by the CCMS shall include system and location information for use by the CCMS and AID systems to monitor and quickly identify issues. All data shall be stored for historical and reporting purposes.

g. CDOT ITS staff will cross-train Developer operations staff to assist with operator duties beyond the Cover MEP System (refer to Section 12.8 for Developer training requirements). CDOT will provide one seating area with a desk and computer for housing at the CTMC. Developer shall provide software, licensing, and remote access to all Cover MEP System elements for control and monitoring All Cover MEP System functionality, monitoring and control shall be able to be performed remotely from the CTMC.

12.17.2. Basis of Design

The Cover and its approaches shall be controlled and managed by the Developer from the CTMC where the operators will be able to interact with the CCMS to ensure the safety of all Users within the Cover. Provide a backup operations room in accordance with NFPA 502 clause 13.5.6, in the event of the system at the CTMC being unavailable.

12.17.3. Design Criteria

The Cover has been assessed as Category C under NFPA 502. As such the requirements of NFPA 502 section 4.5/7.5 (Emergency Communications), 7.4 (Fire Detection/CCTV), 7.6 (Traffic Control) and 7.16.1 (Emergency egress and signage) shall apply as mandatory requirements.

12.17.4. CCMS Control and Monitoring Facilities

The CCMS shall provide the Cover operations staff the ability to monitor the operation of the Cover and the immediate approaches.

a. Ventilation

i. The CCMS shall allow the Cover operations staff the ability to monitor the operation of the CVS. It shall be possible to monitor the current status of all ventilation fans on a single screen using a pictorial representation. From this screen it shall be possible to interrogate the detailed status of individual fans and fan controllers.

ii. The CCMS shall have the facility for the operator to over-ride the normal automatic operation of the CVS, either as whole or just specific fans. In an Emergency, automatic and manual settings on the CVS shall be over-ridden by a predefined Emergency ventilation plan.

iii. The CCMS shall have the ability to raise an alarm to the operator if any Element of the CVS becomes faulty. It shall raise a second alarm if the fault will cause the Cover to operate below the agreed minimum operational threshold.

b. Drainage

i. The CCMS shall provide Cover operations staff the ability to monitor the operation of the drainage system. It shall be possible to monitor the current status of all drainage system components on a single screen using a pictorial representation. From this screen it shall be possible to interrogate the detailed status of the drainage system components such as level sensors, pumps and valves.

ii. The CCMS shall provide the facility for the Cover operator to over-ride the normal automatic operation of the drainage system (e.g. inhibit or turn on pumps or close/open valves). In an Emergency, manual settings on the drainage system shall be over-ridden by a predefined Emergency drainage plan.

iii. The CCMS shall raise an alarm to the operator if any Element of the drainage system becomes faulty. The CCMS shall raise a second alarm if there is an imminent risk of flooding within the Cover.

c. Lighting

i. The CCMS shall provide the Cover operations staff the ability to monitor the operation of the lighting system in the Cover. It shall be possible to monitor the current status of the entire lighting system on a single screen using a pictorial representation. From this screen it shall be possible to interrogate the detailed status of individual lighting system Elements.

ii. The CCMS shall provide the facility for the Cover operator to over-ride the normal automatic operation of the lighting control system. In an Emergency, manual settings on the lighting control system shall be over-ridden by a predefined Emergency lighting plan.

iii. The CCMS shall raise an alarm to the operator if any Element of the lighting system becomes faulty. It shall raise a second alarm if the fault will cause the Cover to operate below the agreed minimum operational threshold.

d. Fire Main

The CCMS shall monitor the current status of the fire main system including pumps, pump controllers, trace heating, level sensors and input pressures. The CCMS shall monitor the pressure on the fire main within the Cover. The CCMS shall raise an alarm to the operators if the pressure is outside predefined limits.

e. Fixed Firefighting System

i. The CCMS shall monitor the current status of the FFFS. It shall present the current status of the FFFS to the Cover operators on a graphical user interface (GUI).

ii. The CCMS shall raise an alarm if any Element of the FFFS becomes faulty. It shall raise a second alarm if the fault will cause the Cover to operate below the agreed minimum operational threshold.

iii. The CCMS shall allow the Cover operator to selectively operate the FFFS based upon the fire location reported by the FDAS.

f. Emergency Way-Finding System

i. The CCMS shall monitor the status of all Emergency way-finding signs and present this to the Cover operators via a GUI. In the event that an Emergency is detected, the appropriate Emergency plan shall be set automatically.

ii. The CCMS shall raise an alarm to the Cover operator if any Element of the Emergency way-finding system becomes faulty. It shall raise a second alarm if the fault will cause the Cover to operate below the agreed minimum operational threshold.

g. Radio Rebroadcast Systems

i. The CCMS shall monitor the status of all radio rebroadcast systems and present this to the Cover operators via a GUI. The CCMS shall raise an alarm to the operator if any Element of the radio rebroadcast system becomes faulty. It shall raise a second alarm if the fault will cause the Cover to operate below the agreed minimum operational threshold.

ii. The CCMS shall allow the Cover operator to broadcast speech messages selected from a list of predefined Emergency safety announcements into the Cover and its immediate approaches through a voice break-in facility in the domestic radio rebroadcast system. The CCMS shall recommend the message to be broadcast based upon the information available within the CCMS.

h. Voice Alarm/Public Address System

i. The CCMS shall monitor the status of the voice alarm public address system and present this to the Cover operators via a GUI. The CCMS shall raise an alarm to the operator if any Element of the voice alarm and public address system becomes faulty. It shall raise a second alarm if the fault will cause the Cover to operate below the agreed minimum operational threshold.

ii. The CCMS shall allow the Cover operations staff to broadcast speech messages selected from a list of predefined Emergency safety announcements into the Cover and its immediate approaches through a system of public address loudspeakers. The CCMS shall recommend the message to be broadcast based upon the information available within the CCMS.

i. Automatic Incident Detection System

i. The CCMS shall monitor the status of the AID system and present this to the operators via a GUI. The CCMS shall raise an alarm to the operator if any Element of the AID system becomes faulty. It shall raise a second alarm if the fault will cause the Cover to operate below the agreed minimum operational threshold.

ii. The CCMS will monitor the vehicle detection system for incidents. If an incident is detected, the CCMS shall alert the operator and recommend the actions to be taken.

j. Fire Detection and Alarm System

i. The CCMS shall monitor the status of the FDAS and present this to the Cover operators via a GUI. The CCMS shall raise an alarm to the operator if any Element of the FDAS becomes faulty. It shall raise a second alarm if the fault will cause the Cover to operate below the agreed minimum operational threshold.

ii. The CCMS shall monitor the FDAS for indications that fire may be present and if a fire is detected, the CCMS shall alert the operator and recommend the actions to be taken. If no response is received from the operator within a predetermined time limit, the recommended action shall be automatically applied.

iii. The automated FDAS shall be supplemented with manual fire alarm call points situated at every Portal, every cross bore door and at all Emergency panels. The operation of the manual call points and the automated FDAS shall be coordinated by a fire alarm control panel and monitored by the CCMS. The fire alarm control panel shall permit the fully automated control of the fire and life safety systems by the CCMS but shall allow local manual override facilities.

iv. The FDAS shall have a direct connection to the Fire Department station/control room as well as the Cover Control Center.

k. Plant Room Systems

The CCMS shall monitor the status of all plant room equipment such as the HVAC, lighting, intruder alarm or building fire alarm and present this to the Cover operators via a GUI. The CCMS shall raise an alarm to the operator if any Element of the plant room equipment becomes faulty.

l. Power Distribution System

The CCMS shall monitor the status of the power distribution system and raise alarms to the operators in the event of any faults in the power distribution system. The CCMS shall also monitor the status of the Uninterruptible Power Supply (UPS) systems and raise alarms if the Cover systems are being powered solely from the UPS. The CCMS shall raise an alarm if either of the incoming mains supplies have failed. It shall raise a second alarm if both incoming supplies have failed and will recommend the closure of the Cover.

m. Power Supply to CCMS and ITS Equipment

All CCMS and ITS required for the Cover MEP Systems equipment shall be supplied by an Uninterruptible Power Supply (UPS) in accordance NFPA 70. This UPS shall be sized to sustain the operation of all critical systems for a minimum of 90 minutes.

n. Ramp Meter System Interface

The CCMS shall interface to the ramp meter at the westbound Vasquez Blvd. entrance ramp. This interface shall permit the CCMS for the Cover to close the approaches to the Cover.

12.17.5. Interfaces

The CCMS shall provide interfaces to the operations, maintenance and management system and the Project ITS. These interfaces shall permit:

a. The CCMS to report and manage faults to the Maintenance Management Information System;

b. The CCMS to demand override control from the Project ITS as stated in Schedule 10, Section 12.17. All overrides shall allow the CCMS to automatically take control of the field devices, and subsequently return control to the respective system utilized for normal operations, which shall retain the ability to monitor the status and operation of the device during CCMS overrides. The CCMS system shall also automatically provide notification to the Department's web services Enterprise Service Bus (ESB) in a structured normalized data format at the start and end of override for each device.

12.17.6. Location and Protection of ITS Elements

Wherever possible, ITS equipment will be mounted in the plant rooms of the services buildings. Wherever this is not possible, the equipment will be installed in high corrosion resistance stainless steel enclosure. These enclosures will be sealed to prevent the ingress of high pressure water jets (such as those used for wall cleaning and from the FFFS) and dust including that arising from the burning of diesel fuels by road vehicles.

12.17.7. Non Functional Requirements

a. Emergency Points

At each of the locations of the Emergency telephones, hydrants and fire alarm call points, the Developer shall provide an Emergency point. Emergency points shall be clearly labeled as such, fabricated of stainless steel and, as a minimum contain portable fire extinguishers, the Emergency telephone and required firefighting equipment.

b. Cable Management System

A full cable management system will be provided in the cornice on each side of the roadway and on the soffit on the centerline of the roadway. The cable management system will be provided using open high corrosion resistance stainless steel cable tray, raceway or conduit.

c. Cabling Requirements

Cables installed in the Cover shall be constructed using low smoke and fume insulation. Cables containing halogens will not be permitted in the Cover. Cabling for essential and life-safety systems shall be constructed from fire survivable materials.

12.18. Electrical Systems

12.18.1. Basis of design

The Developer shall design, provide, install, test and commission all electrical power systems in accordance with the appropriate NFPA standards or other such applicable standards and specifications of the AHJ. The Developer shall allow attendance at all performance testing and demonstrations by the Department and relevant Local Agencies or appointed representatives. The Developer shall undertake all necessary surveys and investigations to validate its design including, but not limited to utility surveys, investigations, enquiries with relevant Governmental Authorities and for obtaining all necessary Governmental Authorities.

12.18.2. Design Criteria – Electrical Power

a. The requirements of NFPA 502 – Chapter 12 Electrical Systems (clause 12.1.5) shall be incorporated into the design.

b. The electrical systems shall be designed to support life safety operations, fire Emergency operations, and normal operations. The electrical systems shall be designed to allow for routine maintenance without disruption of traffic operation.

c. Subject to Section 1(g)(i) Part B of Schedule 28 (*Proposal Extracts*), the main electrical distribution shall be configured, interconnected and controlled to allow all services to the Cover to remain operational in the event of a single power supply transformer failure in the substation at either end of the Cover.

d. Main switchboards shall be configured with interlocking automatic transfer switch(es) to allow for Emergency standby generator installation to be connected to serve all essential services supplies to the Cover.

e. Diesel generators shall be provided for backup purposes in order to run the Cover in the event of a failure of both electrical supplies.

12.18.3. Design Criteria – Emergency Power

a. Emergency Standby Generator

Emergency Power for a minimum period of eight hours shall be provided by an Emergency standby generator in accordance with Article 700 of NFPA 70. (For Emergency and standby power systems as NFPA 110).

b. The following systems shall be connected to the Emergency power system:

i. Emergency lighting;

ii. CCMS and ITS;

iii. Emergency way-finding signs;

iv. Emergency communications systems and network communication;

v. Cover drainage system;

vi. VCS and emergency ventilation;

vii. CCTV cameras;

viii. FFFS;

ix. FDAS;

x. AID System; and

xi. Environmental monitoring and intruder detection.

c. Emergency Power Circuits

Emergency circuits installed in the Cover and ancillary areas shall remain functional for a period of not less than one hour, for the anticipated fire condition.

d. Emergency circuits shall comprise one of the following:

i. Fire-resistive cables;

ii. Circuits embedded in concrete that are protected by a two-hour fire barrier system; and

iii. By the routing of the cable system external to the roadway using diversity in system routing as approved, such as separate redundant or multiple circuits separated by a one hour fire barrier, so that a single fire or Emergency event will not lead to a failure of the system.

e. Emergency Power UPS System

Subject to Section 1(g)(ii) of Part B of Schedule 28 (*Proposal Extracts*),

i. Two separate UPS systems shall be provided within each of the services buildings located near each end of the Cover. One of these will feed the lighting system while the other will feed the remaining safety critical plant.

ii. The UPS specification shall be developed based on the following;

A. Three-phase, on-line, double-conversion, static-type, UPS units with 90 minute battery autonomy;

B. 20% Spare capacity;

C. N+1 parallel redundant configuration; and

D. External wraparound bypass unit

12.18.4. Design Criteria – Containment

Containment shall be provided throughout the Cover for all cabling services. Separate containment systems shall be provided for power and control/communications cabling, segregated in line with Good Industry Practice. Armored cables shall be run on cable trays with non-armored cables run in raceway or conduit to suit the required routing. Control and communications cables shall be run in conduit.

12.18.5. Design Criteria – Cabling

All cables and associated materials shall be insulated or clad using low smoke, zero halogen (LSOH) materials and where required, certain cables will be fire survivable cables.

12.19. Lighting

12.19.1. Scope

a. The Developer shall design and install lighting systems in accordance with the Illuminating Engineering Society RP-22-11 to provide coverage for the full length of the Cover to achieve the following objectives:

i. To provide safe illumination for the passage of vehicular traffic at the posted speeds through the Cover;

ii. To reduce any visual adaptation problems caused by the external luminance of the external scene when approaching the Cover by the uses of increased threshold illumination ensuring that stationary traffic or other obstructions are visible to the approaching traffic;

iii. To provide exit lighting if necessary to cope with visual adaptation problems for drivers leaving the Cover;

iv. To provide Emergency lighting to cover the safe egress of drivers in an Emergency either by the means of dedicated means of egress or via cross passage doors;

v. To reduce maintenance costs and associated health and safety risks by mitigating/controlling maintenance procedures and their frequency;

vi. To reduce energy costs associated with the lighting systems; and

vii. To allow full control of the lighting systems to allow stepless dimming control between the lighting zones.

12.19.2. Site specific conditions

The Developer shall take into consideration in its design the east - west orientation of the Cover, which creates specific lighting demands in terms of Threshold Luminance levels, the external view of the Cover has been assessed as being scene 4 from figure 3 in RP-22-11. This means that the threshold level has been initially assessed to be 26 cd/ft^2 due to the posted speed of 60 mph.

12.19.3. The Developer's General Obligations:

The Developer shall be responsible for providing the following services:

a. Design and development of the Cover general and Emergency lighting;

b. Develop, design, install and put into operation an integrated lighting control system that complies with the Construction Standards and interfaces with the CCMS to facilitate a coordinated operation and management of the Cover;

c. Develop a system that facilitates monitoring by the CCMS of all faults and alarms generated by the lighting system including individual lighting fixture and control gear feedback; and

d. To provide operational and maintenance manuals and as built drawings in sufficient detail and depth that the day to day operation of the Cover can be carried out in an efficient manner by the maintenance operatives.

12.19.4. Choice of Light Source

The lighting system shall be light emitting diode (LED) based.

12.19.5. Basis of design

a. The Developer shall base its design upon a high wall reflectance (including recessed flush sidewall-mounted cabinets at low level) of >30% to increase the inter-reflected component and help reduce the need for more lighting fixtures in the Threshold Zone in particular.

b. This Section 12.19.5 relates to the systems located within the Cover only (excluding above or for the approaches to the Cover).

12.19.6. Design Criteria

a. The lighting systems shall be designed and constructed to meet the standards and guidance identified within IESNA RP22-11.

b. Table 12-2 shall be used as initial criteria for the Cover lighting design, and adjustments in accordance with RP-22-11 procedures will be allowed.

Table 12-2 Lighting Criteria for Cover

Criteria	Value
Posted Speed	60 mph
AADT	>15000
Cyclists	No
Wall reflectance	70/5020
Cladding height	9.8ft
Maximum threshold luminance (taken table 2 RP-22-11)	26cd/ft^2
Transition Zone 1	26-10.6 cd/ft^2 average
Transition Zone 2	10.6-4.6 cd/ft^2 average
Exit zone	To be agreed
Daytime Interior zone	0.9 cd/ft^2 average
Night Time Luminance	Min 0.3 cd/ft^2
Uniformity ratio ave/min	2.0/1
Uniformity ratio max/min	3.5/1
Veiling illuminance ratio	0.3

c. The lighting system within the Cover shall be designed as the philosophy for a full tunnel with variable lighting systems in the Threshold Zones, Transition Zones, Exit Zones and constant light within the Interior Zone. The Cover lighting shall to be reduced to a lower night-time level 0.9cd/ft^2.

d. The lighting system shall aid visibility of the Cover and any stationary traffic within the Cover. The lighting system shall be able to adapt to the external luminance of the external scenes when approaching the Portals or exiting the Cover. The lighting at the Portals shall increase and reduce accordingly either by switching or dimming. Solar shades may be considered as an alternative to excessively high levels of luminance within the threshold and high concentrations of fixtures. The lighting system shall be chosen to minimize maintenance requirements and be suitable for the aggressive environment within the Cover.

e. The lighting systems shall be provided with the ability to dim in the range of 1-100%. The lighting system shall be controlled by a system of luminance photometers located within the first 65 foot of the Cover at both Portals. The luminance photometers will measure the external scene luminance. Threshold lighting shall be provided as necessary based on orientation of the Cover. Initial brightness of the external Portal scene has been taken to be scene 4 (RP-22-11 figure 1).

f. The lighting fixtures will have symmetrical optics and be fixed to the structural soffit of the underside of the Cover. The fixtures shall be in rows or multiple rows aligned with the center line of the lanes. The spacing between the fixtures will be chosen to avoid flicker, noting that continuous line is preferable. The fixtures shall consist only of the LEDs and their optical lens housed within a sealed IP66 enclosure capable of being pressure hosed. The

fixtures are to be connected to the electrical distribution panels (EDPs) via specially constructed cables that have IP66 connectors. The EDPs are to house the LED drivers in fire rated enclosures. The fixtures are to be supplied by two separated electrical supplies providing interleaved circuits so that alternate fixtures are fed from the same supply. EDPs and cable runs along walls shall be fully recessed and covered into or enclosed within the sidewalls the use of surface mounted cabling, conduit, raceways and cable trays etc. within the tunnel sidewall finishes zone is not permitted.

12.19.7. Emergency Lighting

The Emergency lighting within the Cover traffic zone shall be provided by a subset of the general lighting. The Emergency lighting shall be fed by a segregated fire survival cable network capable of running the Emergency lighting for the statutory minimum duration of two hours. The Emergency lighting level shall be a minimum 1 ft. cd (10.8 lux) for a minimum duration of 90 minutes. The Cover Emergency lighting will enable way-finding to the dedicated means of egress. The escape exits shall be illuminated to 10 ft. cd (108 lux). The sources of power for the Emergency lighting and standby lighting will be the UPS systems.

12.19.8. Lighting Control Systems

a. The Developer shall design, supply, install, commission and set into operation a complete lighting control system. The Cover lighting will be controlled by an automatic lighting control system. The lighting control system will utilize an open lighting control protocol to control, vary, scene-set and fault monitor all the fixtures within the traffic zone of the Cover.

b. The lighting control system shall be interfaced with the CCMS system and provide information in coordinated manner on the status of the lighting system. The lighting controls system shall also include luminance sensors monitoring the actual luminance provided by the lighting system on the pavement in each of the lighting zones. Alarms shall be generated when designed maintained illuminance levels are not met.

c. The lighting control system shall use industry recognized protocols such as DALI or 1-10V to control the lighting a then to be integrated on to the communications backbone and then to the CCMS. Information from the Cover Portal photometers shall be communicated to the lighting control system with appropriate output from the CCMS to the lighting control system. The Developer shall provide appropriate graphics pages for indicating real time status, faults and alarms on the lighting systems on the GUI. Individual fixtures/drivers will have a unique address and report status. Light output and any faults including run hours to the central lighting monitoring software located on the ITS server/head-end.

12.19.9. Portal Photometer System

The Developer shall design, supply and install an automatic Portal dimming system to balance threshold luminance in line with the real time external luminance. The photometers shall use the CIE 88 L_{20} philosophy for sampling angle of 20 degrees of the external scene. The photometers shall be duplicated for each Cover bore and be operated in a run and standby mode with automatic switch over on failure. The run time of each photometer shall be balanced over the period of four week period. The photometer system shall be interfaced with the CCMS.

12.19.10. Requirements

a. System Description

The Cover shall be illuminated for both day time and night time scenarios to provide a safe lit environment for vehicular traffic and routine maintenance works:

i. The lighting shall be designed for vehicular traffic in a uni-directional situation in each bore for a posted speed of 60 mph;

ii. The lighting shall include threshold transition and Exit Zones;

iii. The lighting shall include both standby and Emergency lighting provisions in line with the Construction Standards and Project specific Site generated requirements;

iv. The lighting shall be automatically controlled to various design parameters to satisfy environmental conditions standard lighting functional requirements and non-standard incident requirements through dimming and scene setting regimes; and

v. The light fixtures and support installation shall be designed in such a manner to reduce consumed energy and minimize maintenance activities.

b. Light fixtures

The fixtures shall be designed to a minimum of IP66 and shall have a designed service life of a minimum fifteen years. The luminaires shall be tested to IESNA LM79 for LED fixtures.

c. Light source

The Developer shall provide fixtures with LED light sources with a color rendering factor of >60Ra$_{14}$. The LEDs shall be arranged in such a manner as they all contribute to the whole of light distribution. The LEDs shall an L80 lumen depreciation factor at a minimum of 80,000 hours and shall a have a mortality of B10 at 80,000 hours. The Lumen depreciation factor shall be calculated according to IESNA LM80 for 6,000 hours at an ambient temperature of 95ºF.

12.19.11. Control Gear/Drivers

The Developer shall supply fully electronic control gear matched to the lamp source which shall function fully to either the 0-10v protocol or the DALI protocol.

12.19.12. Emergency and Standby Lighting

The Developer shall develop the Emergency lighting and standby lighting provisions in accordance with the Construction Standards. The Emergency lighting shall include all internal spaces including Emergency escape routes.

12.19.13. Lighting Control System

The Developer shall design a step less dimming lighting control system capable of minimizing energy usage and extending lamp life. The control system shall be fully integrated with the CCMS system and the Portal illuminance system. The system shall report full diagnostic information on each fixture, monitor faults, be capable of setting individual fixture outputs, cumulative scene setting and time scheduling and generate both common and specific alarms.

12.19.14. Electrical Equipment

The Developer shall provide an electrical system suitable for an IP 66 environment including cables, plug and socket arrangements cable support structure and fixings.

12.19.15. Interfaces

The interfaces as shown in Table 12-3 between the lighting and lighting control systems are identified as initial requirements and shall be finalized through the submittal process pursuant to Schedule 9 Submittals.

Table 12-3 Lighting Control System Interfacing

System	Interface	Managing system
Ventilation	None	
Drainage	None	
Lighting	N/A	N/A
Fire main	None	
Fixed firefighting system	None	
Portal Photometer system	Dimming input via analogue system to CCMS and then digital signals to the lighting control system	CCMS linking photometers to Lighting control system
Emergency way-finding system	Testing and monitoring of system status	Lighting control system with status signal via CCMS
Radio rebroadcast systems	None	
Voice alarm public address system	None	
AID system	Go to incident lighting scene	Signal via CCMS
FDAS system	Go to incident lighting scene	Signal via CCMS
Plant Room systems	None	
Power distribution system	None	

12.20. Standpipes, Hydrants and Portable Fire Extinguishers

12.20.1. Scope

The Developer shall design and install standpipes, hydrants and portable fire extinguishers to provide coverage the full length of the Cover, which shall be available in the event of a fire in the Cover to be used to extinguish or suppress the fire.

12.20.2. Basis of design

The Developer shall design, provide, install, test and commission the FFFS and all fire suppression systems in accordance with the Construction Standards and the requirements of the AHJ. The Developer shall allow for all performance testing and demonstrations to the Department and relevant authorities or appointed representatives. The Developer shall undertake all necessary surveys and investigations to validate the design including, but not limited to Utility surveys, investigations, enquiries with relevant bodies and for obtaining all necessary Permits, approvals and consents.

12.20.3. Design Criteria – Standpipes

a. The Developer shall design, provide and install all valves, connections, hangers, inserts, piping, sleeves, fittings, and other appurtenances necessary to provide a fully functional and compliant standpipe system.

b. Subject to Section 1(j) of Part B of Schedule 28 (*Proposal Extracts*):

Standpipes shall be provided in both the eastbound and westbound bores and located in similar locations in each bore at each cross bore door and on the opposite wall. The piping shall be cross connected at cross bore door locations such that either bore can be supplied by either main. Isolation valves shall be provided to enable sections of the system to be shut down for maintenance without shutting the entire system down. A hose connection shall be provided at each cross bore door, in each bore, located adjacent to the door.

c. The standpipe system shall be a dry pipe system supplied from the municipal water company mains supply. Dry pipe system shall be manually filled from the water supply (with automated control via the CCMS to be provided as a backup). Outside of the Cover

limits, within the limits of the Lowered Section, automated backup control is not required. The Developer shall conduct testing in accordance with NFPA 14 to determine that the supply is capable of supplying the system demand for a minimum period of one hour and of delivering water to all hose connections on the system within 10 minutes or less. In the event that tests indicate that the supply is not capable of meeting the system demands, the Developer shall provide suitable pumping equipment to maintain system pressures.

d. The required flow rate shall be 750 gpm at the hydraulically most demanding outlet. Allowance shall be made for two hydrants operating simultaneously. The calculation procedure shall be in accordance with section 7.10.1.2.2 of NFPA 14 or in accordance with the requirements of the AHJ. The minimum residual pressure at the hydraulically most remote 2.5 inch outlet shall be 100 psi. Pressure restricting valves shall be provided where the hydraulic head exceeds 100 psi.

e. Standpipes shall be Class 1 dry type system as defined by NFPA 14 subject to the agreement of the AJH. A temporary or permanent standpipe system shall be installed and tested during the construction phase in accordance with NFPA 14, NFPA 25, NFPA 502 and NFPA 241 and to the requirements of the AHJ.

f. Hose connection spacing shall be such that that no location within the protected area is more than 150 feet from the hose connection. Hose connection spacing shall not exceed 275 feet.

g. The entire standpipe system including valves shall be protected against freezing and shall be complete with all necessary status monitoring and alarms linked to the CCMS system.

h. The standpipe system shall be suitably protected from mechanical damage and vandalism.

i. Suitable back flow prevention devices shall be installed to prevent contamination of the Water Company supply and distribution system.

j. The standpipe system shall be provided with drain points to enable the entire system to be drained down.

k. The pipework system shall be protected from unequal settlement or structural movement by the use of appropriate flexible jointing couplings.

l. Suitable fire collars shall be provided where piping passes through fire rated structure.

m. A two way Siamese coupling shall be provided at both ends of each bore to allow the Fire Department to provide backup water supplies, the location of these connections shall be agreed with the Fire Department. The Developer shall provide all fire hydrants and associated piping.

n. “Standpipe Connection Stations” with hose connections shall consist of a protective enclosure that also houses portable fire extinguishers. Each standpipe connection station shall have two, 2.5 inch, hose connections with an external thread in accordance with NFPA 1963 or as otherwise required by the Fire Department. The standpipe connection station cabinets shall be located in recesses in the side walls of the Cover to finish flush with the wall surface.

o. The Developer shall provide an appropriate signage system in accordance with NFPA 14 and to the approval of the Fire Department.

12.20.4. Design Criteria - Portable fire extinguishers

a. Portable fire extinguishers shall be provided in accordance with NFPA 502 with a rating of 2-A: 20-B: C and shall be located along the Cover of both the Eastbound and Westbound bores. They shall be co-located in approved standpipe connection stations and at intervals of not more than 300 feet. The maximum weight of the extinguishers shall be 20 pounds. The installation shall be in accordance with NFPA 10 and its associated reference documents.

b. The removal of an extinguisher shall be capable of being detected by the use of a pressure pad or similar device with an alarm raised via the CCMS system.

12.20.5. Design Criteria - Standpipe connection stations

The Developer shall design and construct standpipe connection stations with protective enclosures constructed of grade 316 stainless steel. The enclosure shall be provided with suitable alarms to indicate when a door has been opened and also where an extinguisher has been removed. The alarm shall be raised via the CCMS system. The standpipe connection station cabinets shall be located in recesses in the side walls of the Cover to finish flush with the wall surface.

12.20.6. Cover – Washing

In case the Developer chooses to perform Cover washing operations with a road tanker with suitable pressure washing equipment or other Accepted method, the Developer is not required to provide a piped water supply system within the Cover for washing operations.

12.20.7. Information on how the Cover Standpipes, Hydrants and Portable Fire Extinguishers are to be operated in an Emergency with demonstration of how the design facilitates effective self-rescue and Fire Department intervention shall be placed in the Fire System Performance Report.

12.21. Drainage Systems

12.21.1. Scope

a. The Developer shall design and install a drainage system in accordance with this Section 12.211 and Schedule 10, Section 8 Drainage for the full length of the Cover along I-70 Mainline to collect and discharge water that results from the discharge of FFFS, standpipe fire suppression systems and water washing operations. The drainage system shall also capture hazardous substances that may arise following a fuel tanker accident occurring within the limits of the Cover. The capture collection system shall be a total minimum of 500 gallons.

b. The Developer shall consult with the appropriate Local Agency to agree on the required method of collecting and managing the proposed drainage effluent prior to design. The Developer shall prepare and submit a Spill Prevention Control and Countermeasures Plan (SPCC) related to spills occurring within the limits of the Cover in accordance with the Colorado Discharge Permit System – Stormwater Construction Permit (CDPS-SCP).

12.21.2. Basis of design

The Developer shall design, install, test and commission a drainage system in accordance with the requirements of NFPA 502, FHWA Road Tunnel Design Guidelines and other such applicable standards and requirements of the AHJ. The systems shall be complete and fully functional. The Developer shall provide advance notification to the Department, AHJ and affected Local Agencies of all performance testing and demonstrations.

12.21.3. Design Criteria

a. The drainage system shall consist of gullies, drain pipe, grit chambers and water seals, and shall be of sufficient capacity so as not to cause flooding to I-70 Mainline.

b. The drainage system shall be designed to prevent spills of hazardous substances or flammable liquids from propagating along the roadways. The system shall intercept roadway drainage from an arrangement of side gutter catch basins or other drain inlets, such that the length of surface drain path from any potential spill point to the drain inlet is minimized. Components of the drainage system, including the main drain lines, shall be noncombustible and minimize flame propagation.

c. Grit chambers and water seals shall be used in conjunction with either gullies or manholes per FHWA Road Tunnel Design Guidelines, and shall not exceed spacing requirements in accordance with Schedule 10, Section 8 Drainage. All gratings and manhole covers shall be lockable and designed for the design vehicle loadings.

d. To prevent contamination of the receiving storm-water drainage system, the drainage effluent shall be monitored for levels of contamination. The Developer shall either demonstrate the feasibility of an on-Site treatment and construction of such on-Site treatment facilities, or construct facilities that contain the effluent for haulage and treatment off-Site. The effluent shall be automatically diverted to a holding tank when unacceptable levels of contamination are detected. A manual means of diverting contaminated effluent shall also be provided. The holding tank shall be complete with fire suppression systems, hydrocarbon sensors, effluent quality monitoring equipment, water level monitoring and alarms. All sensors and alarms shall be raised via the CCMS system. An alarm shall also be provided local to the plant.

e. Where drainage gullies are provided, the distance between gullies should be such that the catchment area for each gully will not exceed 2,700 ft^2 and so that the longitudinal distance between gullies shall not exceed 65 feet.

f. The Developer shall consult with the municipal drainage authority to confirm that its drainage system is capable of receiving the design discharge without storage or attenuation.

g. Where a gravity connection to the municipal drainage authority drainage cannot be achieved, the Developer shall provide suitable pumping equipment to raise the effluent to a level that will enable connection. The pumping chamber, wet well and service chambers shall be classified for hazardous locations in accordance with NFPA 70 and 820. The installation shall be fitted with pollution and hydrocarbon sensors with alarms raised via the CCMS system. An alarm shall also be provided local to the plant.

h. All software utilized for design shall be referenced in all calculations and reports produced by the Developer.

12.22. Requirements Management

12.22.1. The Developer shall develop and implement a comprehensive Requirements Management (RM) process for the Cover MEP System, defining how the technical requirements are parsed, captured, documented, derived, apportioned, traced, managed, verified (by CDOT, AHJ, and relevant stakeholders), and validated and which shall also include standard operating procedures for all use cases. The proposed process shall be documented and Accepted by the Department prior to beginning the process.

12.22.2. The Developer shall develop and manage a requirements database for the management and reporting of the RM process. The requirements database shall include all requirements in these specifications and the requirements that may be added or modified during contract scope modifications.

12.22.3. The Developer shall furnish a conventional, off-the-shelf (COTS) product for a requirements management tool, which makes use of a spreadsheet or relational database for the management of Cover MEP requirements. The Developer shall submit the Preliminary Requirements Traceability Matrix (RTM) to the Department for Information with the Final Cover Design Baseline Report.

12.22.4. The Developer shall provide updates to the RTM throughout the Project, as requested by the Department.

12.22.5. The Developer shall keep the Department's version of the RTM synchronized with the Developer's requirements database by performing a monthly synchronization. Each requirement within the requirements database shall have a unique identifier, be unambiguous, and non-repetitive. Each requirement within the RTM shall be assigned a functional allocation, which allocates the requirements into the functional areas based on the associated subsystem. Each requirement within the RTM shall also be mapped to the associated deliverable where the requirement is addressed and to the specifications.

12.22.6. The Developer shall produce RTM reports. The RTM reports shall list each Project requirement from the Project specifications and provide traceability to each test procedure in which this requirement will be tested.

12.22.7. The Developer shall submit an RTM Report, with each RTM Submittal, that lists only those requirements addressed within the deliverable and the associated mapping of each requirement to where the requirement is addressed.

12.22.8. The Developer shall be responsible for testing every requirement listed in the RTM against pass/fail criteria stated in the Commissioning Test Plan.

12.23. Testing and Commissioning

12.23.1. Testing

Construction acceptance testing is required to demonstrate the efficacy of the constructed FFSS system.

a. The construction acceptance testing shall be performed using the constructed Cover MEP System, at least 30 days prior to interim acceptance. This test is in addition to any tests needing to be performed under NFPA 13.

b. The FDAS system shall be tested using a controlled (non-fire) heat source. The automatic and manual actuation systems shall be tested. The system shall be actuated in the most hydraulically remote zone of the system in each tunnel. The flows and pressures shall be measured to ensure the design spray densities are satisfied. The test shall be conducted for a minimum of 10 minutes to demonstrate the capacity of the delivery network. Simultaneously, the standpipe system will be operating to ensure adequate pressures and flows are available to both sprinkler and stand pipe flows. A test is considered successful when design spray densities are obtained. No fires shall be started in the Cover for the tests.

12.23.2. Commissioning

All mechanical, electrical, and software systems shall be inspected and tested as part of a complete commissioning program. The Developer shall complete commissioning testing in accordance with NFPA 13 and NFPA 502. As a component of the commissioning, all Cover Elements shall be initially (baseline) inspected by the Developer following the National Tunnel Inspection Standards.

a. All mechanical, electrical, and software systems shall be tested as part of a complete commissioning program.

b. Commissioning testing shall be performed in accordance with NFPA 13 and 502 and shall include at a minimum the following elements:

i. Component and equipment

ii. Communication links

iii. Status, control, alerts, and alarms

iv. Interfaces between subsystems

v. Integration among new and existing subsystems

vi. Failover on faults

vii. Functioning of redundant components

c. The Developer shall arrange for commissioning to be carried out by a commissioning agent/engineer with demonstrated experience in commissioning tunnel systems within the past five years. The Developer shall complete commissioning of all systems for the Department's Acceptance prior to opening any section on the I-70 Mainline for public use whether as a temporary detour measure or permanently after Substantial Completion.

d. The Developer's commissioning agent/engineer shall prepare and submit a Commissioning Test Plan, for Acceptance, detailing how all the tests will be carried out prior to the start of any testing. The test plan shall be based on the technical specifications and performance characteristics of all devices, equipment, parts, assemblies, systems, subsystems, software and devices for the Cover.

e. All elements subject to testing shall be included in the testing schedule. The Developer shall conduct weekly commissioning meetings with the Department to be held beginning 90 Calendar Days prior to the scheduled start of testing to review the status of the testing and planning for future tests.

f. A Full Scale System Test Program shall be prepared and submitted to the Department for Acceptance. The full-scale system test shall involve non-destructive testing of all systems supplied and installed to demonstrate compliance with the functional performance requirements of the overall integrated system. The full-scale test shall also be witnessed by representatives of the Department and AHJ. The scope, methods, and timing of the full-scale test shall be submitted in the Full Scale System Test Program prior to the proposed test date. A Full Scale System Test Report shall be prepared and submitted to the Department for Acceptance 14 Calendar Days after testing and prior to interim acceptance.

12.23.3. Temporary Traffic Phasing

Should bi-directional traffic be placed in one of the Ultimate bores in a temporary condition, the Developer shall address all Cover system operations, maintenance and monitoring in a plan submitted to the Department for Acceptance. Including but not limited to:

a. Ventilation that provides adequate pollution monitoring and control in the Cover;

b. Lighting;

c. Emergency response and access;

d. Emergency egress;

e. ITS and communications;

f. Signage; and

g. Monitoring and Operations plan

12.24. Manuals and Documentation

12.24.1. The Developer shall produce and submit to the Department, for Acceptance, a Functional Design Specification (FDS) supported by drawings for every system. Each submitted FDS shall contain a description of the detailed design relevant to the Cover MEP System operations.

12.24.2. The Developer shall submit all design calculations to the Department with each design submittal.

12.24.3. The Developer shall prepare a comprehensive project specific Tunnel Operation, Maintenance, Inspection and Evaluation Manual (TOMIE) in compliance with and covering all aspects of the FHWA TOMIE Manual in relation to all Elements of the Cover, with the exception of the Cover Top O&M Work. The National Tunnel Inspection Standards (NTIS), the FHWA TOMIE Manual, and the Specifications for the National Tunnel Inventory (SNTI) shall be referenced in the Developer's TOMIE and used in addition to the Developer's TOMIE, during the Operating Period.

12.24.4. The Developer's TOMIE documentation shall include documented software codes, fault finding flow charts and all necessary guides to allow the maintainer to make future changes and configuration. The Developer shall provide As-Built drawings and operation and maintenance documentation for every item of equipment. All final documents shall be issued in MS Word format and all final drawings in AutoCAD format. All interim documents may be issued in Adobe Acrobat format.

12.24.5. The Developer's TOMIE shall include a complete parts list. The parts list shall include a list of all parts supplied, down to the lowest level part or assembly that is user-replaceable. Commodity

supplies such as conduits, conductors, and pipes do not need to be included. The parts list shall include part numbers, description, system application or use, manufacturer, and supplier. The parts list shall identify sole-source and propriety parts. For all sole-source and proprietary parts, compatible or alternative parts shall be identified. The estimated Residual Life of parts that have a service life less than 30 years shall be identified.

12.24.6. The Developer's TOMIE shall also include a complete consumable supplies list. The supplies list shall include a list of all materials required for routine maintenance of the equipment supplied under the Project Agreement. The supplies list shall include material name, description, function, application rate and frequency, manufacturer, and supplier.

12.24.7. The Developer's TOMIE shall include inspection procedures compatible with State and Federal requirements for initial (baseline), routine (periodic), and in-depth (hands-on) inspections.

12.25. Spare Parts

The Developer shall provide the manufacture's recommended spares. The spares shall comprise 10% of operational equipment rounded up to the nearest whole unit.

12.26. Deliverables

At a minimum, the Developer shall submit the following to the Department for Information, Acceptance, or Approval in accordance with the specified timeframes:

Table 12-4 Deliverables

Deliverable	Information, Acceptance, or Approval	Schedule
Final Cover Design Baseline Report	Acceptance	Prior to RFC Documents
Fire System Performance Report	Acceptance	Prior to RFC Documents
Emergency Response Plan	Acceptance	Submitted with the Cover Design Baseline Report and updated 60 days prior to Cover opening to traffic.
Requirements Traceability Matrix (RTM)	Information	Submitted with the Cover Design Baseline Report
Functional Design Specification (FDS)	Acceptance	Prior to RFC Documents
Commissioning Test Plan	Acceptance	Prior to undertaking the testing
Commissioning of all system	Acceptance	Prior to Cover opening to traffic
Full Scale System Test Program	Acceptance	Prior to undertaking the testing
Full Scale System Test Report	Acceptance	14 Calendar Days after testing
Tunnel Operation, Maintenance, Inspection and Evaluation Manual (TOMIE)	Acceptance	Prior to Cover opening to traffic

13. STRUCTURES

13.1. General

13.1.1. The Developer shall design and construct all structures required to meet the Project requirements and make the Project fully functional in accordance with the requirements of the Project Agreement and this Section 13.

13.1.2. To advance longer-lasting highways, the Department encourages using innovative technologies and practices to accomplish the fast construction of efficient and safe highways and bridges. Consideration by the Developer of state-of-the-art technologies and elevated performance standards that result in improved safety, faster construction, reduced congestion from construction, improved quality, and user satisfaction are encouraged.

13.1.3. All construction, reconstruction and rehabilitation of structures, from I-25 to I-270 and from I-270 to Chambers Road, shall be designed and constructed to the Ultimate configuration geometric requirements.

13.2. Applicable Standards and Software

13.2.1. AASHTO Load and Resistance Factor Design Standard Specifications shall be used for all new structures. For modifications to existing structures, the Developer has the option of using LRFD Specifications or the specifications which were used for the original design. Subject to Section 13.5.6.d.viii, the CDOT *Bridge Design Manual* shall be followed.

13.2.2. Collision load (CT) shall be in accordance with AASHTO LRFD Bridge Design Specifications. The use of a TL-5 barrier in accordance with AASHTO Sect. 3.6.5.1 is allowed.

13.2.3. All Construction Work required to be performed by the Developer pursuant to this Section shall comply with the Construction Standards, the relevant requirements listed in this Section 13, and Good Industry Practice.

13.2.4. Railroad Grade Separations

a. The Developer shall coordinate with the Railroads in accordance with Schedule 10, Section 10 Railroads for any structures Construction Work within Railroad right-of-way or affecting Railroad operations.

b. All Railroad grade separation structures shall be designed and constructed in accordance with the BNSF Railway-Union Pacific Railroad *Guidelines for Railroad Grade Separation Projects* and the American Railway Engineering and Maintenance-of-Way Association (AREMA) *Manual for Railway Engineering*. Structures, including permanent and temporary structures, shall be coordinated with the respective Railroads and are required to meet all applicable requirements. The UPRR service road bridge shall be an independent structure that will not carry railway tracks and shall be designed using AASHTO LRFD Specifications and CDOT *Bridge Design Manual*.

13.2.5. Structure Aesthetics

The Developer shall comply with Schedule 10, Section 14 Landscaping and Aesthetics in its design and shall comply with the specified materials and finishes treatments, concepts and details for all components of all structures (bridges, retaining walls, noise walls, sign structures, etc.). In all cases, proposed structure aesthetics, including all visible surfaces, shall be submitted to the Department for review with the Developer's proposed general layouts of each structure. This submittal shall include drawings illustrating form, texture, and color. The Developer shall provide full-size mockups for all proposed surface treatments showing texture, color, and quality for Approval by the Department.

13.2.6. Load Rating

a. Load rating methodology shall be in accordance with CDOT's Load Rating Manual and policy, and the AASHTO Manual of Bridge Evaluation.

b. The Developer shall review the latest inspection reports, As-Built plans and carry out visual inspections to load rate the existing bridges.

c. Thrust shall not be used in the design or rating of buried culverts.

d. Bridges and major culverts under railway tracks shall be rated in accordance with AREMA. For all other structures, the following rating software shall be used for the Project:

i. AASHTOWare BrR, Bridge Load Rating; and

ii. AASHTOWare BrR, Culvert Load Rating.

13.3. Design Requirements

13.3.1. All highway bridge structures shall be designed for 36 pounds per square foot (psf) dead load to account for overlays, as specified in this Section.

13.3.2. Bridge spans shall be proportioned to avoid uplift at supports due to non-seismic loads. If the Developer demonstrates to the satisfaction of the Department that uplift cannot be reasonably avoided, anchorage shall be designed to meet the requirements of the appropriate specifications AREMA or the AASHTO LRFD Specifications.

13.3.3. Design structures for thermal forces for cold climate temperature ranges.

13.3.4. Geotechnical Data

a. Preliminary subsurface investigations have been conducted for the Project and are provided in the Reference Documents. The Developer shall be responsible for any additional subsurface investigations that it considers necessary to complete the Construction Work.

b. The soil and rock samples collected as part of the geotechnical investigation are stored by and available from the Department. The Developer may submit a request to the Department to obtain these geotechnical samples (for inspection and testing as it may consider necessary to supplement its design) no later than 90 Calendar Days after the issuance of NTP 1. At the end of 90 Calendar Days, if the Developer has not submitted such request, the Department will dispose of the samples. If the Developer does submit a request and takes possession of these samples, then the Developer shall be responsible for their storage and disposal.

c. Existing groundwater observation wells are present within the Site. The Developer shall be responsible for their abandonment or renewal of the Permits for these wells in accordance with Colorado Division of Water Resources requirements. The Developer shall be responsible for installing any additional groundwater observation wells it considers necessary to monitor water level or water quality, including applying for and obtaining the necessary Permits.

13.3.5. Materials

a. Concrete

i. Type II or Type I cement may be used for cast-in-place concrete. Type III cement may be used for precast concrete. Cement shall meet the requirements of Section 601.04 of the CDOT Standard Specifications for sulfate resistance. Class B concrete may be used for panel noise barriers. Class BZ concrete shall be used for drilled caissons. Class B concrete shall be used for filling post holes and slope paving. Class D or H concrete shall be used for all conventionally reinforced bridge decks. Class D concrete shall be used for bridge rails, abutments, piers, and walls. Class D, PS, or S40 concrete shall be used for all pretensioned or post-tensioned concrete. The concrete used for cast-in-place bridge decks shall be dense, with low permeability, highly resistant to abrasion, and it shall resist cracking due to creep and shrinkage. The bridge deck concrete

shall have a maximum water/cement ratio (w/c) of 0.45, chloride permeability of 2000 coulombs or less in 56 Calendar Days as tested in accordance with American Association of State Highway and Transportation Officials (AASHTO) T 277, and shrinkage of 500 microstrain or less as tested per ASTM C157. The proposed mix design and procedures shall meet the above requirements and shall be submitted for Acceptance by the Department. The use of lightweight concrete will not be allowed.

ii. Minimum design concrete strengths shall meet the requirements of Section 601 of the CDOT Standard Specifications.

iii. Maximum design concrete strengths used for design shall be:

A. Cast-in-place: f'c = 6.0 ksi; and

B. Precast: f'c = 10.0 ksi.

b. Pre-Tensioning Steel

The maximum diameter for prestressing strands shall be 0.6 inch for a two inch minimum spacing and 0.5 inch for a 1.75 inch minimum spacing.

c. Post-Tensioning Steel Systems

The Developer shall provide corrosion protection for the strands consisting of grout-filled galvanized or non-metallic ducts. Grout shall meet the requirements of Section 618 of the CDOT Standard Specifications. Prestressing system plants shall be certified by the Post-Tensioning Institute (PTI). The diameter for strands shall be 0.6 inch or 0.5 inch.

d. Reinforcing Steel

The use of epoxy coated reinforcing steel for all bridges, walls, box culverts, and barriers shall adhere to the requirements of Table 1, Subsection 8.1 of the CDOT *Bridge Design Manual*. The design category for the anticipated level of de-icing salt application shall be "High". Abutments, pier columns, barriers, retaining walls, and any other reinforced concrete structures exposed to splash from adjacent roadway shall use epoxy-coated reinforcing steel. All reinforcing shall consist only of deformed bars per American Society for Testing and Materials (ASTM) A 615.

e. Structural Steel

i. Structural steel shall conform to AASHTO M 270, Grades 36, 50, 50S, 50W, HPS 50W, or HPS 70W.

ii. Additional structural steel grades to be used for any pedestrian structures and architectural structures shall include ASTM A106 or A53 for pipe shapes or ASTM A500 (Grade B) for steel structural tubing shapes.

13.4. Existing Structures

13.4.1. Removal

a. The Developer shall remove existing structures as shown in Table 13-2.

b. The removal of Railroad structures shall meet the requirements of the respective Railroad.

c. Bridge removal shall consist of the complete removal of all superstructure and substructure elements for the reconstruction of new structures at these locations.

d. Removal of the substructure shall be taken down to at least one foot below the future ground surface or subgrade at the lowest point of interface. Holes resulting from substructure removal shall be backfilled with structure backfill (Class 2) to the adjacent existing grades.

e. The Developer shall submit a Bridge Removal Plan, for each structure that is to be removed, to the Department no less than 21 Calendar Days prior to start of demolition. The Bridge Removal Plan shall detail procedures, sequences, and all features required to perform the removal in a safe and controlled manner. The Bridge Removal Plan shall provide complete details of the bridge removal process and meet the requirements as specified in Revision of 107 Performance of Safety Critical Work, located in the Project Special Provisions set out in Appendix A to this Section 13.

13.4.2. Load Rating Additional Existing Bridges

a. The Developer shall load rate the existing structures as shown in Table 13-1 and submit to the Department for Acceptance.

Table 13-1 Existing Structures to be Load Rated

Structure Description	Structure No.
I-70 Over Sand Creek	E-17-AER
I-70 Over Havana Street	E-17-VD
I-70 over UPRR spur track (near Havana Street)	E-17-VE

13.5. Bridges

13.5.1. Bridge superstructure types that would require falsework or shoring are permitted. All falsework shall be designed in accordance to the AASHTO *Guide Design Specifications for Bridge Temporary Works*.

13.5.2. The bridge structures and actions identified for the Project are listed in Table 13-2.

Table 13-2 Actions for bridge structures

Existing Structure No.	New Structure No.	Structure Location and Description	Action
E-17-UY E-17-US	E-17-AEU E-17-AEV	I-70 westbound over Brighton Boulevard I-70 eastbound over Brighton Boulevard	Removal and reconstruction Removal and reconstruction
E-17-FX	N/A	I-70 Viaduct (Brighton Boulevard to Colorado Boulevard)	Removal
E-17-Z	N/A	UPRR Bridge under I-70	Removal
N/A	E-17-AEW E-17-AEX	UPRR over I-70 UPRR Service Road over I-70	New construction New construction
N/A	MISC-E-17-IT	Sanitary Sewer Bridge over I-70 (at York Street)	New construction
N/A	E-17-AEY	York Street over I-70	New construction
N/A	MISC-E-17-IU	Storm Sewer Bridge over I-70 (at York Street)	New construction
N/A	E-17-AEZ	Josephine Street over I-70	New construction
N/A	E-17-AEL	Cover (Columbine to Clayton)	New construction
N/A	E-17-AEN	Fillmore Street over I-70	New construction
N/A	E-17-AEO	Steele Street over I-70	New construction
N/A	E-17-AEP	Cook Street over I-70	New construction
N/A	E-17-AFA	BNSF Market Lead over I-70	New construction

Existing Structure No.	New Structure No.	Structure Location and Description	Action
N/A	E-17-AFC	Monroe Street over I-70	New construction
E-17-HU E-17-HT	E-17-AFD	Colorado Boulevard over I-70	Removal and reconstruction
E-17-HY E-17-HZ	E-17-AFF E-17-AFG	I-70 westbound over Dahlia Street I-70 eastbound over Dahlia Street	Removal and reconstruction Removal and reconstruction
E-17-HW E-17-HX	E-17-AFH E-17-AFI	I-70 westbound over Holly Street I-70 eastbound over Holly Street	Removal and reconstruction Removal and reconstruction
E-17-GC E-17-GD	E-17-AFJ E-17-AFK	I-70 westbound over Monaco Street I-70 eastbound over Monaco Street	Removal and reconstruction Removal and reconstruction
N/A	E-17-ADT	N Stapleton Drive over Denver Rock Island Railroad	New construction
E-17-EW E-17-DF	E-17-AFN E-17-AFO	I-70 westbound over Denver Rock Island Railroad I-70 eastbound over Denver Rock Island Railroad	Removal and reconstruction Removal and reconstruction
N/A	E-17-ADU	Quebec eastbound exit ramp over Denver Rock Island Railroad	New construction
E-17-GA E-17-GB	E-17-AFQ E-17-AFR	I-70 westbound over Quebec Street I-70 eastbound over Quebec Street	Removal and reconstruction Removal and reconstruction
E-17-AER	N/A	I-70 over Sand Creek	Existing bridge previously constructed
E-17-KR	E-17-AFS	Eastbound I-270 over I-70	Removal and reconstruction
E-17-VD	N/A	I-70 over Havana Street	Bridge constructed under Havana Design Build Project
E-17-VE	N/A	I-70 over UPRR spur track (near Havana Street)	Bridge constructed under Havana Design Build Project
E-17-IQ	E-17-AFT E-17-AFU	I-70 westbound over Peoria Street I-70 eastbound over Peoria Street	Removal and reconstruction Removal and reconstruction

13.5.3. Geometry

All fill and cut slopes along the longitudinal axis of bridges with spill-through abutments shall not be steeper than 2:1. There shall be a two foot berm at the top of the slopes at the front face of abutments and a two foot minimum dimension from the top of this berm to the bottom of girder. Minimum vertical clearance of 16.5 feet (from travelled way and shoulders) shall be provided for all highway grade separations. Pedestrian bridges or Utility/irrigation structures over roadways shall provide a minimum vertical clearance of 17.5 feet. The minimum structure widths shall be as shown in the Structure Typical Sections as provided in Schedule 10B Contract Drawings.

13.5.4. Type

a. Bridge types are not restricted to those historically used by the Department. The Developer may propose other types and components and submit to the Department for Approval. The Department will make its assessments by taking into account, among other factors, as to whether the type has been accepted for general use by other transportation authorities and the Developer has demonstrated that the design of the bridge type and components will perform well under the Project's environmental conditions, including frequent freeze-thaw cycles, anti-icing and de-icing.

b. Experimental bridge types, timber bridges, masonry bridges, and structural-plate arches shall not be permitted.

c. Bridges shall incorporate as few joints and bearings as possible, be continuous over supports, not use intermediate hinges, and use integral or semi-integral abutments wherever possible.

d. Fracture critical bridges for highway traffic shall not be permitted.

e. Precast double tees or precast box girders without a cast-in-place deck placed on top shall not be permitted.

f. If not supplied in this Section 13, the Developer shall obtain structure numbers for new structures from the Department.

g. The Developer may use bridge girders with the cross-dimensions indicated in Exhibit K of Part B of Schedule 28 (*Proposal Extracts*) as an alternative to the cross-dimensions provided for in the CDOT *Standard Structural Worksheet B-618*, provided that such bridge girders have a design basis identical to the bridge shapes contained in the CDOT *Standard Structural Worksheet B-618* and otherwise comply with the applicable requirements of the Project Agreement.

13.5.5. Inspection Access

a. All bridge superstructures, joints, and steel-reinforced elastomeric bearing pads with sliding surfaces and high load multi-rotational (HLMR) bearings shall be made accessible for long-term inspection and shall be designed and detailed for ease of replacement, including jack locations, and required jack sizes. The bridge shall be designed to withstand the loads and forces with the superstructure jacked.

b. Superstructures consisting of I-girders with exposed cross frames shall be made accessible with walkways, or by use of an A-40 inspection truck. All concrete or steel box girders with an inside depth of five feet or more shall be made accessible for interior inspection.

c. Superstructure of the Cover shall be made accessible through ceiling for inspection of all girders and bearings. All pretensioned precast concrete box or tub girders with access shall be provided with low-point drainage through the bottom slab.

d. Access doors shall be placed at locations that do not impact traffic under the bridge, and shall be located to be readily accessible from bridge inspection trucks. Where applicable, the door shall swing into the box girder. The minimum opening for access doors shall be two feet by three feet and locked by a single padlock with lock protector. Access holes, through diaphragms, shall have a minimum diameter of 2.5 feet. CDOT *Standard Structural Worksheet B-618-2* shows typical bottom-slab access-door details.

e. All access holes shall be accessible with ladders from the ground and shall not require access by use of the Department's A-40 inspection truck. Where access doors are provided above slope paving, cleats to support a ladder shall be provided in the slope paving. Location of access holes shall be submitted as part of the design submitted for Acceptance by the Department.

f. Box girders shall be protected from access by vermin.

13.5.6. Components

a. Bridge Rails and Pedestrian Railing

Bridge rails shall be provided on approach slabs. The Developer shall design and construct pedestrian fencing/railing in accordance with AASHTO *LRFD Bridge Design Specifications*. Bridge rails and pedestrian rails not separated from vehicular traffic by bridge rails shall be designed to meet TL-4 loading in accordance with AASHTO *LRFD Bridge Design Specifications*. Pedestrian railing attached to bridge rails shall be installed behind bridge rail face, or back side of bridge rail. Cover plates shall be used over all breaks in the interior and exterior bridge rail, curbs, or sidewalks to provide structural and safety shape continuity across the joint in the bridge rail and to provide face-of-curb

continuity across the joint in the curb for traffic loading at these breaks in bridge rail and curb.

b. Splashguard and Aesthetic Fences

i. A 36 inch splashguard fence shall be provided on both sides of all I-70 Mainline bridges over cross-streets. Splashguard fences shall be in accordance with CDOT *Worksheet B-607-3*.

ii. All cross-street bridges over I-70 Mainline throughout the Lowered Section shall have aesthetic fences in accordance with the Aesthetic Design Standards for Central 70 in Schedule 10B Contract Drawings.

c. Approach Slabs

i. Approach slabs shall be used on each new bridge and shall be a minimum of 20 feet in length measured along the centerline of the bridge, except as specified in Sections 13.5.6.c.ii and iii. Approach slabs shall be separate from and fit between cantilevered wingwalls or retaining-wall wingwalls so that the approach slab can freely rotate about the abutment. Bridge rails with water stopper shall be connected to approach slabs. Bridge rails shall function as a barrier to keep water out of the joint between wingwalls or retaining walls and along the edge of approach slab. The approach slab, for highway bridges, shall be at least the same width as the bridge deck, and provide for expansion and contraction at the approach pavement interface where required. Approach slabs shall be anchored to the abutment.

ii. For the new bridges over I-70 Mainline from York Street to Colorado Boulevard, where the expansion device is located at the back face of the abutment in accordance with Section 13.5.6.e.i:

A. At locations where the adjacent 46th Avenue intersection is constructed of HMA pavement, modified approach slab shall be used for the new bridges over I-70 Mainline from York Street to Colorado Boulevard; or

B. At locations where the adjacent 46th Avenue intersection is constructed of concrete pavement, the adjacent intersection shall be constructed as the approach slab.

iii. Approach slab is not required at the north abutment of the Cover for the length of the synthetic turf field or where expansion joints are not required.

iv. The Developer shall develop and submit to the Department for Acceptance project specific details modifying CDOT Structural Worksheets, found in Schedule 10A Applicable Standards and Specifications, for locations where the expansion device is located at the back face of abutment and modified approach slabs are used in accordance with Section 13.5.6.c.ii.A.

v. The design shall include an underdrain system beneath all approach slabs to reduce water in embankment fills at bridge abutments.

vi. The approach slabs shall be designed for differential settlement such that they will not produce a grade break that is noticeable to the user and shall not be more than one inch by the date that is one year after Substantial Completion. The Developer shall implement ground-improvement techniques to the approach embankment subgrade, if necessary, to meet this requirement.

d. Decks

i. The Developer shall provide a minimum concrete deck thickness of eight inches. Deck thickness for prefabricated pedestrian truss bridges or side by side precast prestressed box or slab bridges shall be 5 inches minimum.

ii. Open or filled grating decks, cast-in-place bare decks, and orthotropic decks shall not be permitted. Concrete decks designed by the simplified "Ontario", or any empirical methods, shall not be permitted.

iii. Full-depth precast deck slabs shall require cast-in-place joint closures and post tensioning across joints and an overlay. Pretensioned, precast concrete deck forms shall be a minimum of three inches thick and have a full grout or concrete bearing. Full grout is defined as a one inch minimum thickness by two inch wide grout pad.

iv. Stay-in-place metal deck forms are permitted. If stay-in-place metal forms are used, the superstructure, substructure, and foundation shall be designed for an extra five psf minimum dead load applied to the superstructure. Stay-in-place metal deck forms shall not be considered part of the structural deck.

v. Parallel bridges shall have a minimum one inch (four inch preferred) longitudinal gap between decks or parapets, or shall be tied together to make one structure.

vi. Permanent deck forms shall not be permitted between girders or stringers where the longitudinal deck joint is located. Permanent deck forms shall not be permitted for cast-in-place post-tensioned box girder or T-girder deck slabs, or cantilevered portions of decks. In order for the cast-in-place portion of concrete placed on top of the top flange of a precast double tee or precast box girder to be considered composite with the precast top flange, the minimum total laminated deck thickness shall be eight inches, the minimum cast-in-place thickness shall be 4-3/4 inches, and the top surface of the precast top flange shall be roughened.

vii. Minimum longitudinal steel in the top mat of cast-in-place decks shall be #4s at six inch spacing spliced to the negative-moment steel reinforcing.

viii. The Developer may elect to design bridge deck overhangs to meet AASHTO *LRFD Bridge Design Specifications* requirements, with the overhang limitations of the CDOT *Bridge Design Manual* to be disapplied provided that the Developer appropriately designs the relevant overhang for all screed rail loads and construction loads. For certainty, the Developer shall be responsible for any damage to any deck, girders or corresponding structural components that results from any increase in a bridge deck overhang as a result of Developer's election to design to meet AASHTO *LRFD Bridge Design Specifications* requirements pursuant to this Section 13.5.6.d.viii, including (A) the risk of any resulting delay, cost and/or expenses and (B) the responsibility to repair and/or replace any such damage.

e. Deck Joints

i. The location of expansion devices shall be at the back face of abutment for the new bridges over I-70 Mainline from York Street to Colorado Boulevard, excluding the south side of the Cover. A waterproofing membrane surface shall be applied to the back face of abutments at each location.

ii. An expansion device is not required at the north abutment of the Cover for length of the synthetic turf field only. The Developer shall complete the Construction Work to protect joints from drainage or debris entering joints.

iii. For the Cover, the location of the expansion device is not allowed within travel or turn lanes.

iv. Expansion device joints shall be covered, providing a smooth surface meeting ADA Accessibility Guidelines requirements wherever located within parking lanes and areas where pedestrian, bicycle, or handicap use is anticipated.

v. Deck design shall avoid or minimize joints in accordance with the guidelines in CDOT *Bridge Design Manual*. A minimum of zero to four inch joints shall be placed at the end of approach slabs or locations of expansion devices shall be submitted to the Department for Approval, except where Section 13.5.6.e.i specifies the required location thereof. A minimum of two expansion devices shall be installed per each bridge.

vi. Joint design shall use strip seals such as D.S. Brown A2R400-SSA2, WABO SE400 Type A, or equivalent product pre-approved by the Department with expected maximum four inch movement or modular joints for expected movements four inches or greater.

vii. Design and location of joints shall provide for maintenance accessibility and future replacement.

viii. Aluminum joints shall not be permitted.

ix. Modular joints shall be tested for fatigue loading according to the National Cooperative Highway Research Program (NCHRP) *Report 402, Fatigue Design of Modular Bridge Expansion Joints*, or NCHRP *Report 467 Performance Testing for Modular Bridge Joint Systems*, as well as the provisions included in Chapter 14 of the AASHTO *LRFD Bridge Design Specifications*.

x. Expansion devices shall be set to provide a smooth surface between the final grade into the device and the final grade out from the device. A smooth surface is defined as a maximum grade break, at 30 feet either side of the device, of 0.3 percent. To facilitate the proper placement of expansion devices, the tabular bridge geometry shall include a bent line for the expansion devices on a bridge or approach slab. Asphaltic expansion devices and asphaltic plug joints shall not be used for any new construction. Silicoflex preformed seals shown on worksheets shall not be used on new construction without Approval by the Department.

f. Overlays

i. The Developer shall provide an initial bridge deck overlay for all bridge decks:

A. For all roadway bridges over I-70 Mainline, overlays shall be 3/4 inch polyester concrete.

B. For all I-70 bridges over Local Agency Roadways, overlays shall be three inch hot mix asphalt (HMA) over a waterproofing membrane or 3/4 inch polyester concrete. The HMA overlay with a waterproofing membrane shall be used on both the bridge deck and associated approach slab.

C. The I-270 over I-70 Mainline bridge shall be constructed with either a three inch stone matrix asphalt (SMA) with waterproofing membrane overlay or a minimum 3/4 inch polyester concrete overlay.

D. Thin-bonded overlays, such as epoxy or polymer concrete, shall be used when widening an existing bridge with a bare concrete deck. The thin-bonded overlay will be applied to both the existing deck and the widened portion.

ii. A monolithic waterproofing membrane and flashings with reinforcing shall be placed on the surface of the bridge deck, continuously across the entirety of Cover, meeting the requirements included in Schedule 10, Section 14 Landscaping and Aesthetics.

iii. A protection course / root barrier protection – at landscape areas or protection course – at vehicular and pedestrian traffic areas shall be placed on the surface of the monolithic waterproofing membrane, continuously across the entirety of

Cover, meeting the requirements included in Schedule 10, Section 14 Landscaping and Aesthetics.

iv. Latex-modified overlays shall not be used.

g. Superstructures

i. Superstructures shall meet the requirements for redundancy, fatigue, crack control, and deflection in AASHTO *LRFD Bridge Design Specifications*.

ii. Field connections shall not be welded, but shall be made with high-strength bolts. Slip-critical connections shall be made with 3/4 inch, 7/8 inch, or one inch diameter, ASTM A325 bolts.

iii. The use of pins and hangers shall not be permitted. Category D or poorer weld details shall not be permitted in tension zones subject to fatigue stress ranges.

iv. The design shall clearly identify the location of all fracture critical members (FCM) and shall follow the procedures specified in the Applicable Standards and Specifications for identification of and requirements for FCMs. Any FCM whose failure would cause a portion of or the entire bridge to collapse is not permitted.

v. The Developer shall follow the Shop Detail Drawing Review/Approval Guidelines developed by the AASHTO/National Steel Bridge Alliance (NSBA) Steel Bridge Collaboration G1.1-2000 for preparation of steel shop drawings.

h. Bearings

i. The Developer shall design and locate bearings to allow maintenance accessibility and future replacement. Substructure drawings shall show locations for lifting when removing bearings. If design loadings allow, elastomeric pads and steel-reinforced elastomeric bearings with or without sliding surfaces shall be used. Sliding surfaces shall be polytetrafluoroethylene (PTFE) with a stainless-steel mating surface. Bearings shall be either elastomeric pads (CDOT Type I), steel-reinforced elastomeric bearings, with or without PTFE and stainless steel sliding surfaces (CDOT Type I or Type II), or HLMR bearings (CDOT Type III). The thickness of Type II bearings shall be designed so that the acceptable shear-deflection limits of the pad are not exceeded if, for some reason, slip does not occur. The design of elastomeric pads and steel-reinforced elastomeric bearings shall be such that pad walk-out will not occur by including pad-walkout restraints. Sole plates, when used, shall have a 3/4-inch minimum thickness.

ii. At expansion bearings, the edge of the sole plate shall not slide past the edge of the elastomeric pad, by the use of a positive stop.

iii. At least three inches of cover shall be provided between anchor bolts and the edge of the concrete pedestal. Reinforcement for pedestals shall be greater than three inches high.

iv. Suppliers of bearings devices shall be selected from the Department's Preapproved Product List. Only one bearing type shall be used across the width of the bridge at any given substructure location. Elastomeric pads and steel reinforced elastomeric bearing devices shall not be mixed with HLMR bearings at any one particular bridge. The minimum HLMR bearing height shall be seven inches.

i. Piers and Pier Caps

i. Aesthetic treatments on piers shall extend below finished grade and be considered for the Ultimate design as necessary to accommodate future construction of the I-70 Mainline and adjacent ramp improvements.

ii. Drop caps or integral caps are acceptable. Integral caps are preferred with cast-in-place or precast concrete box Section systems. The use of integral steel pier caps shall be kept to a minimum.

iii. The design shall include provision for inspection access for integral steel pier caps.

j. Abutments

i. The design shall include integral or semi-integral, end-diaphragm-type abutments for bridge structures whenever possible. Mechanically stabilized earth (MSE) walls may serve as abutment support for bridge superstructure loads. Abutment supported by MSE shall be Geosynthetic Reinforced Soil Integrated Bridge System (GRS IBS). Retaining-wall wingwalls may be used in lieu of cantilevered wingwalls at abutments for all aesthetic categories of bridges. The length of cantilevered wingwalls and/or retaining walls from the end of the abutments of a U-type abutment shall be four feet longer than the point of intersection of the embankment slope with the roadway finished grade.

If GRS abutments are utilized the bridges shall be less than 100' length. The GRS IBS shall follow the CDOT *Bridge Design Manual*.

ii. Backfill behind the abutments shall be as shown in the CDOT *Bridge Structural Worksheets* Backfill Drawings B-206-F1 or B-206-M1.

iii. Structure Backfill (Flow-fill) is allowed behind the abutments.

k. Slope Protection

The design shall include concrete slope protection for all slopes under bridges and on slopes between tiered walls. Slope protection on slopes between tiered walls and any slopes from shoulder to the top of retaining wall shall use similar detail. All structures shall maintain a hard surface between the roadway and face of abutment.

l. Foundations

i. Differential settlement shall not exceed 1/2 inch within a bent or abutment; and span length in (feet)/400 differential settlement between adjacent bents or abutments.

ii. The Developer's Quality Management Plan (QMP) shall include inspection of all drilled caisson operations using either cross sonic log (CSL) or thermal integrity profiler (TIP) non-destructive testing. A minimum of one test is required per each substructure location (each pier and abutment). For requirements see Revisions to Section 503 included in the Project Special Provisions in Appendix A to this Section 13. All drilled caissons while placing concrete shall have a depth vs. volume plot to monitor caving.

iii. Dynamic monitoring of driven-pile foundations using the Pile Driving Analyzer (PDA) tests shall be performed at a minimum of two piles per structure, each at a separate foundation element (abutment or pier foundation), and a minimum of two percent of driven piles to verify that pile capacity, with appropriate resistance factor, meets or exceeds the design-factored load per pile. The PDA tests shall cover pile size, hammer type, and geology condition changes for structures. The PDA tests shall include the measurements for initial driving and re-strike. The Developer may replace or supplement PDA tests with static load tests for piles. Static load tests shall be in accordance with ASTM D-1143 or ASTM D-3996. The exact number, type, layout and location of static and PDA tests shall be per the Developer's QMP. Static axial load tests or PDA on driven piles shall be performed in locations where driven piles will be used and the vertical loads will control the depth of the driven piles. PDA testing criteria including number, type, layout, and location shall be submitted to the Department for Acceptance.

m. Drainage

i. Gutter flow at both ends of bridges shall be intercepted. Stormwater flowing toward the bridge shall be intercepted prior to the expansion device of the approach slab. Stormwater flowing away from the bridge shall be intercepted prior to leaving the approach slab. Backup drainage plan between girder and abutment/pier underneath the expansion device shall be provided. All stormwater shall be directed to an appropriate outfall. Permanent erosion protection shall be designed and installed at all outfall locations to prevent the occurrence of erosion. Outfalls shall have a well-defined and protected flow path.

ii. All bridge deck-drain inlets shall be grated. The bridge deck drainage system shall be compatible with the structural reinforcement, components, and aesthetics of the bridge. Outfalls shall be positioned to avoid corrosion of structural members, and splash on vehicular traffic and pedestrian areas below the bridge. Downspouts for bridge drains shall be minimum 10 inch diameter galvanized steel pipe, and shall meet the requirements of ASTM A53, Grade B, and Standard Weight Schedule 40. Downspout pipe shall be hot-dipped galvanized after fabrication. Galvanizing shall meet the requirements of AASHTO M111. Metal used in the manufacture of castings shall meet the requirements of ASTM A48, Class 35B. Cleanouts shall be provided for downspout systems.

iii. Bridge deck drains shall be located so that downspouts can be taken immediately down pier columns. Bridge drain systems with “horizontal” runs shall not be used unless Approved by the Department.

iv. The bridge deck drain system shall be designed and constructed to be easily modified to accommodate future changes to the median width on the bridge. Downspout and outfall locations shall be located such that no changes are required in the future to accommodate the Ultimate design of the I-70 Mainline and adjacent ramp improvements. The bridge deck drain system shall be designed and constructed not to form icicles under the bridges.

n. Utilities

i. The Developer shall identify, maintain, and coordinate all Utility location on structures. Hanging of Utilities shall not be permitted under deck overhangs or on bridge rail. Protection of the pipes from the settlement of the abutment backfill shall be provided. The Developer shall resolve conflicts between Utilities and proposed structures in accordance with Schedule 10, Section 4 Utilities. A pull box shall be provided for access.

ii. Details of Utilities, Traffic and ITS conduit to be placed on structures shall be included as part of the design submittals to the Department. Utilities Traffic and ITS conduit not hidden from view in superstructure elevation shall not be permitted. Bridge deck drainage or anti-icing pipes shall not be allowed inside of box girders or embedded within concrete structural members.

iii. The Department has identified two Utility structures, as specified in Table 13-2. Proposals for any additional Utility structures shall be submitted to the Department for Approval.

iv. CenturyLink Relocation shall be placed on the proposed Steele/Vasquez Structure to accommodate CNLK-C-201, CNLK-C-202 and CNLK-C-203.

v. Xcel Energy electrical Relocation shall be placed on the proposed Josephine Structure to accommodate XCEL-E-214.

vi. Level 3 Relocation shall be placed on the proposed Josephine Structure to accommodate LEVEL3-C-202.

vii. The Developer shall provide two 2" spare conduits across all bridge structures which shall terminate at pull boxes at the each end of the structure. For the Cover, provide two 2" spare conduits at each roadway crossing which shall terminate at pull boxes at each end of the structure.

viii. CDOT fiber shall not be installed in the bridge curbs or barriers.

o. Curb and Median

i. The concrete curb and median cover material on the bridge deck and approach slabs shall be constructed to allow removal and modification in the future without causing damage to the bridge deck concrete and reinforcement.

ii. Concrete curbs with 9 inch height shall be constructed on bridge decks and approach slabs for all bridges over I-70 Mainline with sidewalks. The Developer shall overlay bridge decks with 3 inches of HMA or 3/4 inch polyester concrete in accordance with Section 13.5.6.f. All roadway bridges over I-70 Mainline shall be constructed with a final 8 1/4 inch minimum exposed curb height between street and sidewalk grades.

p. The protecting of bridge Elements and roadway/pedestrian areas from bird droppings shall be required in the design. The Developer shall eliminate all potential pigeon roosting and nesting areas and/or install various control systems, such as plates, grating, nets, spikes, electric systems, and wires as Approved by the Department at bearing areas, abutment and pier caps, and areas above pedestrian traffic. Bird control and nest removal shall be taken into consideration when planning long-term maintenance.

13.6. Cover

13.6.1. The Developer shall be responsible for designing and constructing the structural Elements for the Cover and Swansea Elementary School outdoor areas, as such areas are described in Section 14 of this Schedule 10. The I-70 Cover Plans included in Schedule 10B, Contract Drawings (including the landscaping and aesthetic features reflected in such plans) constitute a preliminary 70% design of the Cover and Swansea Elementary School outdoor areas and have been preliminarily agreed upon by the City of Denver and the Department. The Developer shall be required to advance and complete such design of the structural Elements in accordance with the requirements of this Agreement.

13.6.2. The Cover shall meet all requirements as described in Schedule 10, Section 4 Utilities, Section 12 Cover MEP System, Section 14 Landscaping and Aesthetics, Section 16 ITS and Tolling Equipment, and Schedule 10B Contract Drawings.

13.6.3. The Developer shall construct a solid concrete pier wall that extends beyond both ends of the Cover a minimum distance of 130 feet, to prevent recirculation of pollution or smoke from the exit of one bore into the entrance of the other, meeting the requirements specified in Schedule 10, Section 12 Cover MEP System.

13.6.4. Cover Design Loads

a. The Developer's Cover structural design loading shall include:

i. All dead loads (i.e. soil, plantings, fields, utilities, barriers and fences, buildings, lighting, overlay, deck, girders and forms, fire protection, ventilation fans/equipment, and MEP requirements, etc.) specific to the final Cover design. The design loading shall be for fully mature trees.

ii. Pedestrian loading shall be a minimum of 90 psf and shall consider dynamic loading. The dynamic loading shall include rhythmic excitation from lively concerts or sport events activities and shall consider forcing frequencies for first and second harmonic. Within active use areas, the Cover fundamental natural frequency, f_n, shall not be less than the higher of (i) minimum required frequency determined from a rational analysis and (ii) 3.0 Hz.

iii. Excluding the locations of raised planters, Columbine Street and Clayton Street (the requirements for which streets are set out in Section 13.6.4.d), and the areas marked on the Fire Truck Cover Loading Exhibit provided in the Reference Documents, the minimum vehicular live load for the Cover shall be a vehicle equivalent to AASHTO H10 Truck. At raised planter locations, the structural design loading shall be based on critical load (raised planter design loading or vehicle equivalent to AASHTO H10 truck).

iv. At areas marked on the Fire Truck Cover Loading Exhibit, provided in the Reference Documents, the vehicular loading shall be a Fire Truck in accordance with the 2016 Amendments to the Building Code for the City and County of Denver. The design shall provide physical barriers using bollards, walls and other measures that prohibit all other vehicle classes from access to locations on the Cover not designed accordingly. The design shall be coordinated with the Denver Fire Department for approval.

v. Dead load reserve capacity of at least 25 psf shall be included in the structural design for future potential changed conditions that may occur over the design life of the Cover.

b. Structural design requirements for the Cover, except for Columbine Street and Clayton Street (the requirements for which streets are set out in Section 13.6.4.c) shall comply with the 2016 Amendments to the Building Code for the City and County of Denver (snow loading shall be included). The provisions of Section 1607.15 of the 2016 Amendments to the Building Code for the City and County of Denver shall only apply to the areas marked in the Fire Truck Loading Exhibit.

c. Structural design requirements and structural design loading for Columbine Street and Clayton Street shall comply with AASHTO LRFD Bridge Design Specifications, and shall meet all design requirements for highway bridges listed in this Section 13.

d. The portion of the Cover that is designed for H10 vehicular loading is not required to be load rated by CDOT's Load Rating Manual and policy.

e. The portion of the Cover that is designed for fire truck loading, shown in the Fire Truck Loading Exhibit provided in the Reference Documents, shall be rated by CDOT's Load Rating Manual using only the Basic Load Cases for both the Platform Truck and the Ladder Truck in accordance with Section 1607.15 of the 2016 Amendments to the Building Code for the City and County of Denver. Static Loads Cases A and B shall not be used to load rate this portion of the Cover.

f. The portion of the Cover that carries Columbine Street and Clayton Street shall be load rated in accordance with CDOT's Load Rating Manual and policy, and the AASHTO Manual of Bridge Evaluation. The structure section to be used for the load rating calculation shall include those portions of the Cover between the curb as depicted in the Structural Typical Sections in Schedule 10B.

13.6.5. The Cover shall provide a minimum 1 percent slope and maximum 2 percent slope on the structure deck for drainage. Penetrations of the deck for drainage are allowed at locations where other provisions are not possible and upon Approval by the Department. See Schedule 10, Section 14 Landscaping for finished surface grading requirements.

13.6.6. At a minimum, the Developer shall include protection of structural elements including provision for fire protection meeting the requirements of NFPA 502, Section 7.3.

13.6.7. Structures on the Cover shall be attached to the deck.

13.7. CCD Future Cover

13.7.1. Pursuant to Section 1.17.a of Schedule 10, the Developer has an obligation to design and construct the Project so as not to preclude CCD identified improvements for the construction of a future second cover over the I-70 Mainline from 50 feet west of the Steele Street/Vasquez

Boulevard Bridge to 50 feet east of the Cook Street Bridge. Notwithstanding the generality of such obligation, compliance therewith shall include the Developer complying with the following requirements:

a. The Construction Work shall include I-70 Mainline retaining walls as depicted in the Roadway Typical Sections provided in Schedule 10B Contract Drawings as abutments for the future second cover over the I-70 Mainline;

b. I-70 Mainline walls shall be designed and constructed as bridge abutments to withstand loading for such future cover. The design loading to be used shall be the same design loading as for the Cover, as provided in Section 13.6.4.a. Construction of bearing seats or center pier wall (including foundations) for the future second cover are not required; and

c. Sufficient vertical clearance shall be allowed for between the I-70 Mainline and the future second cover, including accommodation for ventilation and fire and life safety elements similar to those required to be provided for the Cover pursuant to Schedule 10, Section 12 Cover MEP System.

13.8. Box Culverts

13.8.1. The Developer shall install box culvert structures as shown in Table 13-3 and shall submit to the Department for Acceptance.

Table 13-3 Box Culverts

Structure Description	Location
Offsite Outfall System	44th Avenue to South Platte River
Onsite Outfall System	Pond
Colorado Boulevard Ponds	Sta 2080+00
Stapleton Drive South Interception	Safeway Distribution Center

13.8.2. Design

a. New box culverts, replacements, extensions, and strengthening, including corresponding head and wingwalls, shall meet the requirements of Schedule 10, Section 8 Drainage. Culverts not covered in the CDOT *M & S Standards* shall be designed in accordance with AASHTO *LRFD Bridge Design Specifications*, CDOT *Bridge Design Manual*, and CDOT *Drainage Design Manual*. Thrust shall not be used.

b. All major box culverts, new and widening of existing, shall be load rated, documented and submitted to the Department, using the AASHTOWare BrR software.

13.9. Retaining Walls

13.9.1. All retaining walls on the Project shall comply with Schedule 10, Section 14 Landscaping and Aesthetics. The Developer shall have sole responsibility for the type, material, performance and safety of temporary retaining structures.

a. Geometry

i. The retaining wall layout shall address slope maintenance above and below the wall and provide returns into the retained fill or cut at retaining wall ends where possible. Final tolerances shall be 1 to 200 for level and plumb. Any residual wall batter shall be into the fill. The Developer shall provide a traversable surface between the wall and the Right-of-Way (ROW) line for maintenance access.

ii. Walls that support soil and loads from outside ROW shall require an appropriate setback from the ROW line for the construction of the wall, permanent easement or a temporary construction easement shall be required. A system shall be

provided to intercept or prevent surface water from entering behind walls. Lengths of wall without relief joints shall be limited to lengths which control the differential settlement. Fencing for fall protection shall be provided, at locations Approved by the Department, at the top of walls over five feet high where access is open to the public or maintenance personnel.

b. Type

Metal walls, including bin walls and sheet-pile walls, recycled material walls, and timber walls shall not be permitted for permanent retaining walls. Wall types selected by the Developer shall have been used successfully in similar geotechnical locations and environmental conditions.

c. Design Requirements

i. All permanent retaining walls and their associated structural support elements constructed for the Construction Work shall be designed to resist corrosion or deterioration for the design service life. A drainage system shall be required for every wall type. MSE walls shall be designed in accordance with the requirements of AASHTO *LRFD Bridge Design Specifications*. All retaining wall installations shall include a positive drainage system of the backfill. The design of MSE and modular walls near or in bodies of water shall account for soft saturated soils and scour and shall prevent fines washout between facing elements. All walls near irrigation lines for landscaping shall account for any additional hydrostatic load due to a waterline break. All MSE walls with drainage lines placed within the strap zone shall account for any additional hydrostatic load due to pipe leakage. Utilities shall not be placed within the strap zone unless otherwise Approved by the Department. Retaining walls shall be designed according to the seismic criteria from AASHTO *LRFD Bridge Design Specifications*. Modifications to the CDOT Structure Worksheets B-504 series as shown in Exhibit J of Part B of Schedule 28 (*Proposal Extracts*) are permitted if made in the applicable MSE wall design submittals and Accepted in accordance with Schedule 9 (*Submittals*).

ii. Temporary retaining walls may be abandoned and left in place if not in conflict with any permanent elements of the Project and Ultimate design. Temporary retaining walls left in place must be completely covered by soil or construction material, so they are not visible.

d. Characteristics

i. MSE (Panel) Walls

A. Wall panels shall be constructed of reinforced concrete and provide corrosion protection for prestressing or post-tensioning steel. A mechanical connection to the wall facing shall be provided. Wall panels exposed to splash from traffic shall use epoxy coated reinforcing steel. Panel joints shall accommodate differential settlement.

B. A barrier shall be provided to prevent fines washout between horizontal and vertical facing panel joints, panel wall construction joints, or relief joints.

ii. MSE (Block) Walls

A. A mechanical connection to the wall facing shall be provided. Friction connections relying on gravity alone are not permitted unless every course of block is connected to the MSE soil mass with a reinforcing layer. MSE block walls are not acceptable for walls at the bridge locations or for primary retaining walls. The Developer may use MSE block walls for secondary retaining wall locations, such as landscaping.

The Developer shall make a list of proposed MSE block wall locations for Approval by the Department.

B. The Developer shall use the FHWA *Design and Construction of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes - Volumes I and II* as guidelines.

C. A barrier shall be provided to prevent fines washout between horizontal and vertical block joints, block wall construction joints, or relief joints.

iii. Cast-in-Place Walls

Cast-in-place walls shall be designed and constructed in accordance with AASHTO *LRFD Bridge Design*. Construction-joint spacing shall accommodate or limit differential settlement. Structural diaphragm walls may be used when top-down construction is warranted.

iv. Anchored Walls

Design and construction shall be in accordance with AASHTO LRFD Bridge Design Specifications using the following documents as guidelines: Post Tensioning Institute (PTI) DC35.1-14 Recommendations for Prestressed Rock and Soil anchors and FHWA DP-90-068, FHWA Geotechnical Engineering Circular No. 4-Ground Anchors and Anchored Systems IF-99-015. Anchors shall be PTI Class 1 protected. The Class 1 protected system shall encapsulate the prestressed anchor inside a plastic sheathing. Performance and proof load tests for anchors shall be provided in accordance with the above PTI guidelines.

v. Soil Nail Walls

Soil nail walls may only be used when top-down construction is warranted. Soil nail walls shall not be used if ground water seepage will be anticipated. Design and construction shall be in accordance with *AASHTO LRFD Bridge Design Specifications* FHWA Manual for the Design & Construction of Soil Nail Walls SA-96-069R, FHWA and Geotechnical Engineering Circular No. 7-Soil Nail Walls NHI-14-007, and use the following documents as guidelines: FHWA *RD-89-186*, FHWA *Soil Nailing Field Inspectors Manual SA-93-068*. . Load testing for nails shall be provided in accordance with the above FHWA guidelines. Final shotcrete surfaces shall be faced to meet the aesthetic requirements of Schedule 10, Section 14 Landscaping ansd Aesthetics.

vi. Caisson Walls

Caisson walls may be used when top-down construction is warranted along areas where ROW or other obstacles are constraining, and alternatives such as soil nail wall construction is not feasible. Caisson walls shall be designed with a permanent concrete fascia, using cast-in- place or precast facing. Walls shall be designed and constructed in accordance with the AASHTO *LRFD Bridge Design Specifications*.

vii. Soil Reinforcement

Soil reinforcement for MSE and modular walls shall be galvanized or epoxy-coated steel, geogrids, or fabrics meeting creep requirements of AASHTO *LRFD Bridge Design Specifications*. The design shall account for any item projecting through the soil reinforcement. The Developer shall avoid placing culverts and Utilities perpendicular to soil reinforcement within the reinforced soil mass. Soil reinforcement shall be protected from corrosion of metal due to stray electrical currents.

13.10. Noise Walls

13.10.1. General

Noise walls shall be designed and constructed to the requirements as provided in the I-70 East EIS and Schedule 17 Environmental Requirements. Noise walls shall be designed in accordance with AASHTO *LRFD Bridge Design Specifications*. Final tolerances shall be 1/8 inch in one foot for level and plumb. The design of noise walls shall provide for adequate surface drainage. When the installation of a noise wall interferes with the access to existing, or proposed fire hydrants, the noise wall installation shall include fire hose access openings and associated identification signs. Location and demand for these openings shall be established in cooperation with the local fire department.

13.10.2. Geometry

When placed behind guardrail, noise walls shall be offset according to AASHTO *A Policy on Geometric Design of Highways and Streets*. The Developer shall place noise walls on top of concrete guardrail when offset space is limited to 10 feet or less.

13.10.3. Design Requirements

a. Panels

Panels shall be constructed of concrete. Panels may be cast-in-place or precast. Panels on bridges shall be cast-in-place concrete and jointed from longitudinal structural elements of the bridge. Panel design and construction shall consider future replacement and/or repair, and shall limit the risk from falling debris resulting from traffic impacting with the noise wall. The Developer may propose other types and components and submit to the Department for Approval.

b. Posts

Posts shall be reinforced concrete, prestressed concrete, or galvanized and painted steel.

c. Foundations

Foundations shall be posts set in concrete, flowfill, caissons, cast-in-place, or precast reinforced concrete footings. The bottom of all spread footing foundations shall be placed a minimum of three feet below finished grade. Reinforcing steel projecting into the above ground portion of walls, subject to splash from the roadway (areas within 10 feet horizontally of the edge of travel lane), shall be epoxy coated.

13.11. Sign Structures

13.11.1. General

a. The Developer shall remove all existing sign structures per the limits as defined in Schedule 10, Section 11 Signing, Pavement Marking, Signalization, and Lighting. Static sign structures and supports meeting the geometric and sign layout requirements shown in the CDOT *M & S Standard Plans*. For static sign structures and supports that do not meet the geometric and sign layout requirements shown in the CDOT *M & S Standard Plans*, the structure shall be designed and constructed in accordance with the latest AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*. Use Fatigue Category I for overhead sign structures. Sign structures shall be galvanized structural steel (single) tubing.

b. Variable Message Signs (VMS) shall be mounted on a sign bridge. The Developer shall prepare a structural design for each VMS structure in accordance with above specified AASHTO requirements and provide to the Department for Acceptance.

c. All sign structures shall include hand holes on poles for addition of future lighting.

d. The Developer shall provide minimum vertical clearance for static and dynamic sign structures in accordance with Schedule 10, Section 11 Signing, Pavement Markings, Signalization, and Lighting.

e. Components

i. Foundations

Drilled caissons shall be used to support overhead and cantilever sign structures. The Developer shall prepare one Project Foundation Report for all sign structures for Acceptance, and shall have one foundation boring near each single caisson supporting monotube sign supports.

ii. Connections

Shop splices shall be made with full-penetration butt welds. Base connections shall be made with full-penetration shop butt welds. All sign connection hardware shall be galvanized, with strengthened structural tubing at electrical connection openings.

iii. Bridge-Mounted Signs

The Developer shall not mount signs on bridges.

13.12. Finishing Structural Concrete Surfaces

Exposed concrete surfaces, in accordance with the Aesthetic Design Standards for Central 70 in Schedule 10B Contract Drawings shall have a surface treatment of concrete stain as specified in Project Special Provisions 601 and 708, Structural Concrete Stain. The color of the structural concrete stain shall be as noted in the Aesthetic Design Standards for Central 70 in Schedule 10B Contract Drawings.

13.13. Submittal Requirements

13.13.1. Structural Concept Reports and Plans

The Developer shall submit a Structural Concept Report and Plans to the Department for Acceptance, for each bridge and retaining wall. Submittal contents shall include:

a. Elevation views and cross sections depicting structure components. Also provide a maximum two-page description of type, materials, and design-life considerations for each proposed structure;

b. For retaining walls, the Developer shall submit:

i. A description of each wall type utilized on the Project;

ii. A description of methods of accommodating settlement and differential settlement;

iii. A description of the type of foundation for each type of wall; and

iv. The location of walls and identification of wall type;

c. Description of conceptual solutions for complex structural problems identified by the Developer;

d. Description of creative or innovative ways the design, construction, and/or choice of structural types will benefit and/or enhance Project Schedule, quality, aspects of the Construction Work, and minimize traffic impacts;

e. Structure Concept Plans, for Acceptance by the Department, including:

i. Plans, elevations, and appropriate typical sections for each bridge type;

ii. Plan views of the structure identifying each bridge location and type. Include documentation of design vehicle turning movement analysis;

iii. Plan views of the structure identifying each wall location and type;

iv. Plan and details for the location and type of expansion joints for the interaction between the Cover and the adjoining infrastructure. Expansion joints shall be fully accessible (not buried) and not located within inaccessible areas including: traffic lanes, retaining walls, buildings, play structures, landscaped areas; and

v. Structure numbers for major structures;

f. For bridge types and retaining walls not historically used by CDOT, the Developer shall submit, for Approval by the Department:

i. A minimum one-page description of each bridge type (or foundation type) and retaining wall not historically used by CDOT; and

ii. A list of the transportation authorities that have used the proposed bridge type and retaining wall (include actual projects, application, performance, and references).

13.13.2. Preliminary (30% Level) Plan Package

Completed general layout drawing(s) shall be submitted for each major structural element. The final geometry and proposed structural type shall have been finalized and shall be shown and detailed in the Developer's drawings. Aesthetic requirements shall have been identified and incorporated into the Developer's drawings. Additional soil borings (if required) shall have been identified and the foundation system shall be shown in the Developer's drawings.

13.13.3. Final (100% Level) Plan Package

The independent design check shall have been completed and the original final structural design calculations shall be revised and corrected based on comments from the independent design check. Aesthetic details shall have been incorporated into the Developer's drawings. All changes or revisions resulting from in-process design progress review meetings, as described in Schedule 8 Project Administration, shall be incorporated.

13.13.4. Release for Construction

Copies in PDF and MicroStation electronic format files shall be made of all plans for all structures and submitted to the Department on computer disk (DVD) format. Falsework and shoring plans shall be signed and sealed by a professional engineer licensed in the State of Colorado.

13.13.5. Shop Drawings and Working Drawings

The Developer shall submit shop drawings and working drawings for each structure in accordance with Table 105-1 of the CDOT Standard Specifications. Shop drawings and working drawings shall be reviewed and approved by the Developer's professional design engineer.

13.13.6. Documentation

The Developer shall submit original design calculations, design-check calculations, and the rating Documents, in PDF format, to the Department as part of the Release for Construction package. A hard copy of certificate letter and a final detail letter shall be also included. As part of the submittals provide the following:

a. Design and design-check calculations shall have pages numbered and include a table of contents;

b. All calculations shall identify which code is utilized, and reference the appropriate section in the right-hand column;

c. References shall be included in the calculations to computer programs used to do the calculations;

d. Computer documentation shall include the following: name of program, vendor, version, and release date; record of software output and verification of output with manual

calculations or other recognized program; clear identification of input and output values and meaning; and check of input; and

e. All calculations shall be signed and sealed by the Developer's Engineer.

13.13.7. Revisions to Release for Construction Documents and As-Builts

a. As a condition of Final Acceptance, the Developer shall submit to the Department on computer disk (DVD) format; changes to Release for Construction Documents, As-Built Drawings, and CADD files of the following documents for each structure:

i. Design and design-check calculations;

ii. Rating packages;

iii. Rating files; and

iv. As-Built Drawings.

13.14. Deliverables

At a minimum, the Developer shall submit the following to the Department for Information, Acceptance, or Approval in accordance with the specified time frames:

Table 13-4 Deliverables

Deliverable	Information, Acceptance, or Approval	Schedule
Bridge Removal Plan	Acceptance	No less than 21 Calendar Days prior to start of demolition
Structure Concept Report and Plans	Acceptance	Prior to proceeding with the design plan packages
Modified approach slab details	Acceptance	Prior to RFC
Proposed bridge, foundation, or wall types not historically used by CDOT	Approval	Prior to proceeding with the design plan packages
Maintenance plan for each bridge type and box culvert structure type used	Acceptance	Prior to RFC Documents
Proposed locations of access holes	Acceptance	Prior to RFC Documents
Project Foundation Report	Acceptance	Submitted as part of the Preliminary Design Package and/or In-Process Design Packages
PDA testing criteria including number, type, layout and location	Acceptance	Prior to RFC Documents
Structural design for each sign structure	Acceptance	Prior to RFC Documents
Alternative Non-Destructive methods for testing non- redundant drilled caissons	Acceptance	As required
Design calculations and design-check calculations	Acceptance	Prior to RFC Documents
Load rating for box culverts	Acceptance	Prior to RFC Documents
Load rating for bridges	Acceptance	Prior to RFC Documents
VMS structural design	Acceptance	Prior to RFC Documents
Full-Size Mockups of surface treatments showing texture, color and quality	Approval	Submitted as part of the Preliminary Design Package and/or In-Process Design Packages
As-Built documents	Acceptance	Prior to Final Acceptance.

13.15. Appendices

Appendix A Project Special Provisions

Appendix A
Project Special Provisions

The following specifications modify and take precedence over the CDOT Standard Specifications. The provisions of Appendix A to Schedule 10A Applicable Standards and Specifications apply to these Project Special Provisions.

PROJECT SPECIAL PROVISIONS

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REVISION OF SECTION 202
REMOVAL OF EXPANSION DEVICE

Section 202 of the CDOT Standard Specifications is hereby revised for this Project as follows:

Subsection 202.01 shall include the following:

This work shall consist of removing existing bridge expansion devices at locations shown on the plans in accordance with the applicable portions of Section 202 of the CDOT Standard Specifications or as amended by these Special Provisions and in conformity with the plans or as directed.

Subsection 202.02 shall include the following:

Removal operations shall be coordinated with the stage construction shown on the plans, indicated in the Special Provisions, or as directed by the Engineer.

The methods and equipment used for the concrete removal shall be approved by the Engineer. The Contractor shall take all steps necessary to avoid damage to all reinforcing steel designated to remain in place. Any reinforcing bars damaged by the Contractor's operation shall be repaired or replaced.

Following the removal of the concrete, all exposed reinforcing steel to remain in place, shall be straightened as required and thoroughly cleaned to sound metal by sandblasting. Any structural steel (top of girders and top of diaphragms) damaged by the Contractor during removal, shall be repaired at the Contractor's expense. Exposed concrete surfaces within the removal limits shall be sandblasted to remove all fractured or loose particles in order to promote good bond with the new concrete.

REVISION OF SECTION 202
REMOVAL OF BRIDGE

Section 202 of the CDOT Standard Specifications is hereby revised for this project as follows:

Subsection 202.01 shall include the following:

This work consists of removal of the existing bridges at the following locations:

Structures to be removed

Structure Description	Structure No.
I-70 over Brighton Blvd	E-17-UY, E-17-US
I-70 Viaduct	E-17-FX
UPRR Bridge Over 46th Avenue	
Colorado Blvd over I-70	E-17-HU, E-17-HT
I-70 over Dahlia St	E-17-HY, E-17-HZ
I-70 over Holly St	E-17-HW, E-17-HX
I-70 over Monaco St	E-17-GC, E-17-GD
I-70 over Denver Rock Island Railroad	E-17-EW, E-17-DF
I-70 over Quebec St	E-17-GA, E-17-GB
I-270 over I-70	E-17-KR
I-70 over Peoria St	E-17-IQ

Bridge removal shall consist of the complete removal of all superstructure and substructure elements unless otherwise shown on the plans.

Subsection 202.02 shall include the following:

The removal of the existing bridge shall be performed in a safe manner.

When removal operations are located over a Railroad or in proximity to any live waterway, additional coordination with the Railroad or other agency, (United States Army Corps of Engineers (USACE), US Fish and Wildlife Service, US Forest Service, etc.) shall be required.

The Contractor shall submit a Bridge Removal Plan to the Engineer, for record purposes only, at least 21 Calendar Days prior to the proposed start of removal operations. This Plan shall detail procedures, sequences, and all features required to perform the removal in a safe and controlled manner. Special procedures shall be provided for the removal of the external post tensioned piers for E-17-FX. The Bridge Removal Plan shall be stamped “Approved for Construction” and signed by the Contractor.

The Bridge Removal Plan shall provide complete details of the bridge removal process, including:

(1) The removal sequence, including staging of removal operations. Sequence of operation shall include a detailed Schedule that complies with the working hour limitations.

(2) Equipment descriptions including size, number, type, capacity, and location of equipment during removal operations.

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REVISION OF SECTION 202
REMOVAL OF BRIDGE

(3) Shoring that exceeds 5 feet in height, all falsework and bracing.

(4) Details, locations and types of protective coverings to be used. The protective covering shall prevent any materials, equipment or debris from falling onto the property below. When removal operations are located over or in proximity to any live waterway, Railroad, or pedestrian/bicycle path, additional width of protective covering sufficient to protect these facilities shall be required. Detailed methods for protection of the existing roadway facilities, including measures to assure that people, property, utilities, and improvements will not be endangered.

(5) Detailed methods for protection of live waterways including minimization of turbidity and sedimentation, and protection of existing wetlands.

(6) Detailed methods for mitigation of fugitive dust resulting from the demolition.

(7) Detailed methods for mitigation of noise resulting from the demolition operation.

(8) Details for dismantling, removing, loading, and hauling steel elements.

(9) Methods of Handling Traffic, including bicycles and pedestrians, in a safe and controlled manner.

A Pre-Removal Conference shall be held at least seven days prior to the beginning of removal of the bridge. The Engineer, the Contractor, the removal subcontractor, the Contractor's Engineer, and the Traffic Control Supervisor (TCS) shall attend the Pre-Removal Conference. The Bridge Removal Plan shall be finalized at this Conference.

The Contractor's Engineer shall sign and seal (1) and (3) listed above in the final Bridge Removal Plan. Calculations shall be adequate to demonstrate the stability of the structure remaining after the end of each stage of removal, before traffic is allowed to resume in its normal configuration.

The final Bridge Removal Plan shall be stamped "Approved for Construction" and signed by the Contractor. The Contractor shall submit a final Bridge Removal Plan to the Engineer prior to bridge removal for record purposes only. The Contractor shall not begin the removal process without the Engineer's written authorization.

Submittal of the Bridge Removal Plan to the Engineer, and field inspection performed by the Engineer, will in no way relieve the Contractor and the Contractor's Engineer of full responsibility for the removal plan and procedures.

Work within Railroad right-of-way shall be in accordance with Section 107. For bridge removal over Railroads, including overhead wires, tunnels and underground facilities, bridge removal plans will be contingent upon the drawings being approved by the Railroad company involved.

Unless otherwise directed, the Contractor's Engineer need not be on site when bridge removal operations are in progress, but shall be present to conduct daily inspection for written approval of the work.

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REVISION OF SECTION 202
REMOVAL OF BRIDGE

The Contractor's Engineer shall inspect and provide written approval of each phase of the removal prior to allowing vehicles or pedestrians on, below, or adjacent to the structure. The Contractor's Engineer shall certify in writing that the falsework, bracing, and shoring conform to the details of the Bridge Removal Plan. A copy of the certification shall be submitted to the Engineer.

The Contractor's Engineer shall inspect the bridge removal site and report in writing on a daily basis the progress of the operation and the status of the remaining structure. A copy of this daily report shall be available at the site of the work at all times, and a copy of the previous day's inspection report shall be submitted to the Engineer daily.

The Contractor shall have all necessary workers, materials, and equipment at the site prior to closing any lanes to traffic to accommodate bridge removal operations. While the lanes are closed to public traffic, work shall be pursued promptly and without interruption until the roadway is reopened to traffic.

Removal of hazardous material shall be in accordance with Schedule 17 Environmental Requirements.

The Contractor shall take all steps to avoid contaminating state waters, in accordance with Subsection 107.25.

Should an unplanned event occur or the bridge removal operation deviate from the submitted Bridge Removal Plan, the bridge removal operations shall immediately cease after performing any work necessary to ensure worksite safety. The Contractor shall submit to the Engineer, the procedure or operation proposed by the Contractor's Engineer to correct or remedy the occurrence of this unplanned event or to revise the final Bridge Removal Plan. The Contractor shall submit his Engineer's report in writing, within 24 hours of the event, summarizing the details of the event and the procedure for correction.

Before removal of the protective covering, the Contractor shall clean the protective covering of all debris and fine material.

Bridge removal may be suspended by the Engineer for the following reasons:

(1) Final Bridge Removal Plan has not been submitted, or written authorization has not been provided by the Engineer to begin the removal.

(2) The Contractor is not proceeding in accordance with the Bridge Removal Plan, procedures, or sequence.

(3) The Contractor's Engineer is not on site to conduct inspection for the written approval of the work.

(4) Safety precautions are deemed to be inadequate.

(5) Existing neighboring facilities are damaged as a result of bridge removal.

Suspension of bridge removal operations shall in no way relieve the Contractor of his responsibility under the terms of the Contract. Bridge removal operations shall not resume until modifications have been made to correct the conditions that resulted in the suspension, as approved in writing by the Engineer.

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REVISION OF SECTION 202
REMOVAL OF BRIDGE

The Contractor shall notify all emergency response agencies of the proposed removal work and any detours 24 hours in advance of work. This shall include the Colorado State Patrol, local Police Department, local Fire Department, all local ambulance services, and the Sheriff's Department, as appropriate.

All required traffic control devices, night time flagging stations, barricades and VMS signs shall be in place, with detours in operation, prior to the beginning of removal operations each day. Night work shall conform to the requirements of the MUTCD, Parts 1, 5, and 6.

Prior to reopening the roadway to public traffic, all debris, protective pads, materials, and devices shall be removed and the roadways swept clean.

Explosives shall not be used for removal work without the written approval of the Engineer.

Removal shall include the superstructure, the substructure, which includes the piers, the abutments and wingwalls, the bridge rail, and any approach slabs and sleeper slabs.

Removal of the substructure shall be taken down to at least 1 foot below the natural existing or future ground surface at the lowest point of interface with the abutment, unless otherwise approved by the Engineer. Holes resulting from substructure removal shall be backfilled with Structure Backfill (Class 2) to the adjacent existing grades.

All other materials removed from the existing structure shall become the property of the Contractor and shall be properly disposed of offsite.

Existing structures, facilities, and surrounding roadways shall not be damaged by the removal operations. Damage that does occur shall be repaired immediately at the Contractor's expense.

REVISION OF SECTION 202
REMOVAL OF PORTIONS OF PRESENT STRUCTURE

Section 202 of the CDOT Standard Specifications is hereby revised for this project as follows:
Subsection 202.01 shall include the following:

This work shall include the removal of all or portions of the following: bridge deck, abutments, piers, wingwalls, rail, curb, expansion devices, approach slabs, slope paving, retaining walls, drainage structures, and light fixtures. Removal operations shall be conducted so that there will be the least interference with public traffic using the structure.

Subsection 202.02 shall include the following:

At least 10 days before beginning bridge removal the Contractor shall submit to the Engineer details of the removal operations showing the methods and sequence of removal and equipment to be used.

If requested by the Department, bridge rail shall be carefully dismantled and stockpiled at locations as designated.

The existing concrete shall be removed as shown on the plans or as directed by the Engineer. If additional removal of unsound concrete is required, it shall be included in the work.

All methods and equipment used to accomplish this item shall be approved by the Contractor's Engineer.

Within 24 hours before new concrete is placed, the entire surface upon which new concrete bonds shall be sandblasted to roughen the surface and remove all fractured or loose particles in order to promote good bond with the new concrete.

In Subsection 202.02 delete the sixth paragraph and replace with the following:

Before beginning concrete removal operations on the existing bridge decks, a saw cut approximately one inch deep shall be made to a true line along the limits of removal. A one inch deep saw cut shall also be made along the limits of removal on all faces of monolithic concrete elements which may be visible in the completed work.

REVISION OF SECTION 202
SANDBLASTING REINFORCING STEEL

Section 202 of the CDOT Standard Specifications is hereby revised for this Project as follows:

DESCRIPTION

Subsection 202.01 shall include the following:

Sandblasting Reinforcing Steel shall consist of cleaning exposed reinforcing steel designated to remain in place following the removal of adjacent concrete and prior to placing new concrete in accordance with the applicable portions of Section 202 of the CDOT Standard Specifications or as amended by these Special Provisions or as directed.

CONSTRUCTION REQUIREMENTS

Subsection 202.08 paragraph 3 shall include the following:

Rust which may form on the reinforcing steel within seven calendar days following the accepted sandblasting, will not be cause for rejection of the steel.

When acceptable reinforcing steel is exposed to the elements for more than seven calendar days prior to encasement in concrete, adequate measures shall be taken by the Contractor, or as approved by the Engineer, to protect the steel from contamination or corrosion. Reinforcing steel contaminated as a result of the Contractor's failure to provide adequate protection as stipulated herein, shall be re-sandblasted.

REVISION OF SECTION 210
REBUILD PORTIONS OF PRESENT STRUCTURE

Section 210 of the CDOT Standard specifications is hereby revised for this project as follows:

DESCRIPTION

This work shall consist of chipping concrete to a minimum depth of 1/8 inch, sandblasting and applying a gel mortar to the damaged area and bring the structure to its original shape.

MATERIALS

The material, to be approved by the Contractor's Engineer, shall be a cementitious, 2-component, fast-setting mortar that is formulated for application by trowel and is especially designed for repair of overhead surfaces.

CONSTRUCTION REQUIREMENTS

Removal and rebuild operations shall be conducted so that there will be minimum interference to traffic below the structures.

The affected areas shall be chipped to a minimum depth of 1/8 inch into existing concrete, all loose concrete will be removed, the area shall be sandblasted and the surface preparation shall be as the product literature describes.

The material shall not be installed in the work prior to the Engineer's approval.

Two copies of the product literature containing pertinent materials and installation of the product supplied on this project shall be furnished to the Engineer at least two weeks prior to the products' installation.

Any damage to portions to remain in place, by the Contractor, in performing the work described above shall be repaired to the satisfaction of the Engineer at the Contractor's expense.

REVISION OF SECTION 502
DRILLING HOLE TO FACILITATE PILE DRIVING

Section 502 of the CDOT Standard Specifications is hereby revised for this project as follows: Subsection 502.06 shall include the following:

When the plans call for drilled holes filled with slurry or mud made from clay or bentonite, the diameter of the drilled holes shall be at least two inches greater than either the pile diameter or the diagonal corner to corner measurement of the pile cross section, unless otherwise designated on the plans. Oversized holes due to sloughing, drifting, over-drilling, or other causes shall be filled with the accepted slurry or mud.

The following mixture will yield approximately 1.2 cubic yards of an acceptable slurry or mud:

50 lbs. dry bentonite powder

Approximately 125 gallons of water (or sufficient amount to make a pourable mix)

1 cubic yard of sand; (approximately 2800 lbs.) reasonably free of material larger than 1/2 inch.

The sand need not be clean. Local soil reasonably free of material larger than 1/2 inch may be substituted for the sand. Cement, lime, flyash, or other pozzolanic or highly alkaline materials shall not be added.

This mixture may be mixed by auger in the drilled hole, by paddle type mortar mixers, by portable or semiportable concrete mixers, or by drum type concrete mixer trucks.

If the mixture is placed or mixed in the hole prior to pile driving, the top two to three feet of the hole may be filled with loose local soil to prevent splashing of the slurry or mud.

REVISION OF SECTION 502
PILING BITUMEN COATING

Section 502 of the CDOT Standard Specifications is hereby revised for this project as follows:
Subsection 502.01 shall include the following:

This work shall consist of furnishing and applying bitumen coating and primer to steel pile surfaces as required in the plans and as specified herein.

Subsection 502.02 shall include the following:

(a) *Bitumen Coating*. Canal Liner Bitumen (ASTM D-252l) shall be used for the bitumen coating and shall have a softening point of l90ºF to 200ºF, a penetration of 56 to 6l at 77ºF, and a ductility at 77ºF in excess of 1.4 inches.

(b) *Primer*. Primer shall conform to the requirements of AASHTO M116.

Subsection 502.11 shall include the following:

All surfaces to be coated with bitumen shall be dry and thoroughly cleaned of dust and loose materials. No primer or bitumen shall be applied in wet weather, nor when the temperature is below 65ºF.

Application of the prime coat shall be with a brush or other approved means and in a manner to thoroughly coat the surface of the piling with a continuous film of primer. The purpose of the primer is to provide a suitable bond of the bitumen coating to the pile. The primer shall set thoroughly before the bitumen coating is applied.

The bitumen should be heated to 300ºF, and applied at a temperature between 200ºF to 300ºF, by one or more mop coats, or other approved means, to apply an average coating depth of 3/8 inch. Whitewashing of the coating may be required, as deemed necessary by the Engineer, to prevent running and sagging of the asphalt coating prior to driving, during hot weather.

Bitumen coated piles shall be stored immediately after the coating is applied for protection from sunlight and heat. Pile coatings shall not be exposed to damage or contamination during storage, hauling, or handling. Once the bitumen coating has been applied, the Contractor will not be allowed to drag the piles on the ground or to use cable wraps around the pile during handling. Pad eyes, or other suitable devices, shall be attached to the pile to be used for lifting and handling. If necessary, the Contractor shall recoat the piles to comply with these requirements.

A nominal length of pile shall be left uncoated where field splices will be required. After completing the field splice, the splice area shall be brush or mop coated with at least one coat of bitumen.

REVISION OF SECTION 503
DRILLED CAISSONS

Section 503 of the CDOT Standard Specifications is hereby revised as follows:

Add Subsection 503.071 immediately following Subsection 503.07 as follows:

503.071 Cross-Hole Sonic Logging.

(a) *General Requirements.*

The nondestructive testing method called Cross-hole Sonic Logging (CSL) shall be used on drilled caissons for the bridge piers.

The testing shall not be conducted until 48 hours after the placement of all concrete in a caisson, and must be completed within 20 calendar days after placement on production drilled caissons. The Engineer may specify a longer minimum time if special retarders, mix designs, or other factors result in slower-setting concrete.

The CSL tests shall be conducted by an experienced independent testing organization retained by the Contractor and approved by the Engineer prior to testing.

The CSL tests measure the time it takes for an ultrasonic pulse to travel from a signal source in one access tube to a receiver in another access tube. In uniform, good quality concrete, the travel time between equidistant tubes will be relatively constant and correspond to a reasonable concrete pulse velocity from the bottom to the top of the foundation. In uniform, good quality concrete, the CSL test will also produce records with good signal amplitude and energy. Longer travel times and lower amplitude/energy signals indicate the presence of irregularities such as poor quality concrete, voids, honeycomb and soil intrusions. The signal will be completely lost by the receiver and CSL recording system for the more severe defects such as voids and soil intrusions.

Upon completion of CSL testing all water shall be removed from access tubes and any other drilled holes. After the CSL results have been evaluated, required repair of defects has been conducted and the repair has been evaluated with another CSL survey, the CSL tubes shall then be grouted at the direction of the Engineer with an approved prepackaged grout having a minimum compressive strength of 4000 psi.

(b) *Preparation for Testing.*

The greater of a minimum of four (4) CSL tubes or one (1) CSL tube per linear foot of the drilled caisson diameter, which maximum number of CSL tubes controls, shall be installed in each drilled caisson, equally spaced around the perimeter of the caisson at 90 degrees.

The CSL tubes shall be Schedule 40 steel with an inside diameter of 1 ½ inches. Galvanized steel will not be permitted. Substitution will not be permitted. Pipes shall have a round, regular internal diameter free of defects or obstructions, including any at pipe joints (all pipe joints shall be threaded without any couplings), in order to permit the free, unobstructed passage of a 1.35 inch diameter source and receiver probe. Tubes shall be watertight and free from corrosion with clean internal and external faces to ensure passage of the probes, and to provide good bond with the concrete.

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REVISION OF SECTION 503
DRILLED CAISSONS

CSL tubes shall be fitted with a watertight shoe on the bottom and a removable cap on the top. The tubes shall be securely attached to the interior of the reinforcement cage with a minimum cover of 3 inches.

CSL tubes shall be installed in each caisson in a regular, symmetric pattern such that each tube is placed the maximum distance possible from each adjacent tube, with a spacing of 90 degrees around the perimeter of the cage as specified above or as shown in the plans. The tubes shall be as near to parallel as possible, and are typically wire-tied to the reinforcing cage every 3 feet, or are otherwise secured such that the tubes stay in position during placement of the rebar cage and concrete. The tubes shall extend from ½ foot above the caisson bottoms to at least 3-feet above the caisson tops. Under no circumstances shall the tubes be allowed to rest on the bottom of the drilled excavation. If the caisson top is sub-surface, the tubes shall extend at least 3 feet above the ground or water surface.

All joints in the tubes required to achieve full-length shall be made watertight. Care shall be taken during reinforcement installation operations in the drilled caisson hole so as not to damage the tubes. After placement of the reinforcement cage and prior to concreting the caisson, the tubes shall be filled with clean water as soon as possible (no later than 4 hours after placement of cage) and the tube tops capped or sealed to keep debris out of the tubes. Care shall be exercised in the removal of caps or plugs from the tubes after installation so as not to apply excess torque, hammering, or other stresses which could break the bond between the tubes and the concrete.

The Contractor shall submit to the Engineer for review the proposed CSL system including equipment schematics, material specifications, tube size, installation details, testing procedures, and joint connections at least 14 days prior to starting drilled caisson construction.

(c) *Typical CSL Test Equipment. Typical CSL test equipment consists of the following components:*

1. A microprocessor based CSL system for display of individual CSL records, analog digital conversion and recording of CSL data, analysis of receiver responses and printing of CSL logs.

2. Ultrasonic source and receiver probes for 1-½ inches to 2-inch inside diameter pipe, as appropriate.

3. An ultrasonic voltage pulsar to excite the source with a synchronized triggering system to start the recording system.

4. A depth measurement device to determine and record depths.

5. Appropriate filter/amplification and cable systems for CSL testing.

(d) *CSL Logging Procedures*.

Before the placement of concrete, a minimum of one tube per caisson shall be plumbed and the tube length recorded, including a notation of the tube projection above the caisson tops. Information on

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the caisson bottom and top elevations and/or length, along with construction dates shall be provided to the Engineer before the CSL tests.

CSL tests shall be conducted between the pairs of tubes encompassing the perimeter and the major diagonals. Testing shall be in accordance with ASTM D 6760. Additional logs shall be conducted at no additional costs to the Department in the event anomalies are detected.

The CSL tests shall be carried out with the source and receiver probes in the same horizontal plane unless test results indicate potential defects, in which case, the questionable zone may be further evaluated with angled tests (source and receiver vertically offset in the tubes). CSL measurements shall be made at depth intervals of 0.5 feet or less, and shall be done from the bottom of the tubes working upward to the top of each caisson. Probes shall be pulled simultaneously, starting from the bottoms of the tubes, over a depth-measuring device.

Any slack shall be removed from the cables prior to pulling to provide for accurate depth measurements of the CSL records. Any defects indicated by longer pulse arrival times and significantly lower amplitude/energy signals shall be reported to the Engineer, and further tests shall be conducted as directed by the Engineer to evaluate the extent of such defects.

Additional NDT methods may be used to evaluate possible caisson defects including Single hole Sonic Logging, Gamma-Gamma Nuclear Density Logging, 3D Tomography, and/or Surface Sonic Echo and Impulse Response tests.

(e) *CSL Testing Results*.

CSL results shall be presented to the Engineer in a report. The test results shall include CSL logs with analyses of:

1. Initial pulse arrival time versus depth

2. Pulse energy/amplitude versus depth

A CSL log shall be presented for each tube pair tested, with any defect zones indicated on the logs and discussed in the test report as appropriate.

Additional needed NDT results shall also be presented to the Engineer in a report format.

Copies of all data (written, electronic, etc.) obtained from the CSL and NDT inspections shall be submitted to the Department in an expedient manner. These submitted copies shall become the property of the Department.

(f) *Evaluation of CSL Test Results*.

The Engineer will evaluate the CSL and NDT (if needed) results within 7 days of receipt from the Contractor and determine whether or not the drilled caisson construction is acceptable. The concrete condition shall be evaluated using the methodology described in Section 20.2.1 of the FHWA Geotechnical Engineering Circular Number 10 (Publication No. FHWA-NHI-10-016

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Drilled Shafts: Construction Procedures and LRFD Design Methods, FHWA 2010). The Contractor shall provide consultants and/or personnel, on an as needed basis, who are experienced and competent performing the above NDT methods.

If the NDT records are complex or inconclusive, the Engineer may require coring in accordance with Subsection 503.071(g) below, or excavation of the caisson to verify caisson conditions.

The acceptance of each drilled caisson shall be the decision of the Engineer, based on the results of the caisson integrity testing report(s), including caisson coring, and other information on the caisson placement. Rejection of a caisson based on the caisson integrity testing shall require conclusive evidence that a defect exists in the caisson which will result in inadequate or unsafe performance under expected loads.

In the case that any caisson is determined to be unacceptable, the Contractor shall submit a plan for remedial repairs, to the Engineer for approval. Any modifications to the foundation caissons and load transfer mechanisms caused by the remedial action will require calculations and working drawings stamped by a Professional Engineer registered in the State of Colorado for all foundation elements affected. All labor and materials required to perform remedial caisson repairs shall be provided at no cost to the Department and with no extension of the contract time.

(g) *Core Drilling of Drilled Caisson Concrete.*

Production drilled caissons that are determined to be unacceptable by the CSL tests shall be cored to determine the quality of the concrete. One core sample shall be taken from each defective caisson for the full depth of the irregularities and for three (3) feet above and below the irregularity.

Because it is desired to obtain a high percentage of core recovery for visual inspection and testing methods, equipment shall be as follows:

1. The core drill shall be in good condition and capable of delivering a smooth flow of power to the bit, both in rotation and down thrust. The pump shall be in good condition and of the positive displacement type. The pump shall be capable of delivering a minimum of 15 gallons of water per minute at 200 psi. It shall be equipped with a relief valve set to release at a maximum of 200 psi. It shall be equipped with a pressure gauge with range from 0 psi to 1,000 psi.

2. The drill shall be size HW or larger. The core barrel shall be size HW or larger, M series, double-tubed, with a chromed inner barrel. The diamond set bit for each hole shall be of best quality, new, and with a minimum of four waterways. A new bit or replacement of the core barrel may be required at any time inspection indicates excessive wear or loss of diamonds.

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3. The core drill machine shall be set so that the drill force will be exactly vertical and so there will be not more than five (5) feet of laterally unsupported drill rod between the bottom of the drill spindle (chuck) and the top of the caisson concrete when the hydraulic feed is in the up position.

   When longer laterally unsupported sections of drill stem are necessary, braced casing or rigidly braced guides must be used to prevent lateral whip.

An accurate log of cores shall be kept and the cores shall be placed in a suitable wooden crate and properly marked showing the caisson depth at each interval of core recovery. The cores along with two (2) copies of the coring log shall be available to the Engineer for inspection and testing. Copies of the coring logs shall be submitted to the Engineer for Information concurrently.

Construction shall not proceed above the drilled caisson until the quality of the concrete in the caisson, as represented by the core samples, is determined to be acceptable and notification to continue construction is given by the Engineer.

If the quality of the concrete in a drilled caisson is determined to be acceptable, or after caisson remedial repairs are complete and accepted by the Engineer, the Contractor shall grout the core hole with an approved prepackaged grout having a minimum compressive strength of 4000 psi.

REVISION OF SECTION 503
THERMAL INTEGRITY PROFILER

Section 503 of the CDOT Standard Specifications is hereby revised as follows:

Add Subsection 503.072 immediately following Subsection 503.071 as follows:

(a) *General Requirements.*

The nondestructive testing method called Thermal Integrity Profiler (TIP) shall be used on drilled caissons for the bridge piers. The TIP testing method uses the heat generated by curing cement (hydration energy) to assess the integrity or quality of cast in place concrete foundations. The expected temperature at any location is dependent on the caisson diameter, mix design, time of measurement, and distance to the center of the caisson.

The TIP tests shall be conducted by an experienced independent testing organization retained by the Contractor and approved by the Engineer prior to testing. The Contractor shall submit documentation that the TIP Consultant has successfully completed at least 3 TIP testing projects within the last 3 years. The testing procedures and equipment shall conform to: ASTM D7949 "Standard Test Methods for Thermal Integrity Profiling of Concrete Deep Foundations" using Method B: Embedded Thermal Sensors.

The Contractor shall cooperate fully with the independent testing company as necessary to facilitate the testing at no additional expense. The Contractor shall provide cooperative assistance, suitable access to the site and caissons to be tested, and labor as required to assist the TIP Consultant in performing the required tests.

(b) Typical TIP Test Equipment.

Typical TIP test equipment consists of, but is not limited to, the following components:

1. A computer based TIP data acquisition system to download and monitor temperature versus time after concrete placement.

2. The data acquisition system shall have the ability to collect data at user defined time intervals between 15 to 60 minutes.

3. Thermal sensor wires that have a minimum accuracy of 1 degree Celsius and have a readability to the nearest 0.1 degree Celsius. The wire(s) connected to the sensors shall be abrasion resistant and remain operational in the range of anticipated temperatures.

The specifications for the equipment to be used and signed certificates of calibration shall be submitted to the Engineer for approval at least 30 days prior to beginning caisson construction as part of the caisson installation plan in accordance with Section 503.04.

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(c) TIP Testing Procedure

Prior to TIP testing, the Contractor shall provide the caisson lengths with elevations of top and bottom and the field inspection and concrete volume logs of the caisson to be tested. The Contractor shall also provide thermal sensor wire lengths, and thermal sensor wire serial numbers corresponding to the thermal sensor wire locations.

The Contractor shall furnish and install a minimum of one (1) thermal sensor wire in each caisson for each foot of caisson diameter rounded down to the nearest whole number (i.e. a 6.5 foot diameter shaft would have a minimum of 6 thermal sensors wires). The thermal sensor wires shall be equally spaced around the perimeter of the caisson, as shown on the plans. The thermal sensor wires shall be placed near the CSL inspection pipes so the results from the tests can be compared. The Engineer shall approve of the thermal sensor wire locations before they are attached to the reinforcement cage. The thermal sensor wires shall be aligned with the longitudinal reinforcement of the shaft. The thermal sensor wires shall be tied to the steel reinforcement using nylon zip-ties spaced at 1.5 to 2 inches from the top and bottom of each thermal sensor node. If the thermal sensor wire is routed with a bend at any location, extra precautions on securing the cable with zip-ties on either side of each such thermal sensor node must be taken.

Each thermal sensor wire shall be attached to the data acquisition system which shall be fixed well above the top of the concrete. Data shall be collected at 15 minute intervals, unless specified differently by the Engineer, for a duration of time specified by the Engineer. It is estimated it will take between 12 and 48 hours to reach peak temperature. In the event that peak temperature is not reached within the specified time period, the data acquisition system will continue to record until the peak temperature is reached. Once the peak temperature has been reached data shall be downloaded so that the TIP consultant can begin evaluating the data and preparing the report. Potential local defects indicated by locally low temperatures relative to the average temperature at that depth, or average temperatures significantly lower than the average temperatures at other depths, shall be immediately reported to the Engineer.

(d) TIP Testing Results

Results of the TIP testing shall be presented in a written report within five (5) working days of completion of testing, i.e. when the data has been downloaded. The report shall include:

1. Graphical displays of all temperature measurements versus depth.

2. Indication of unusual temperatures, particularly significantly cooler local deviations from the overall average temperature, over the entire depth.

3. The overall average temperature. This temperature is proportional to the average radius computed from the actual total concrete volume installed (assuming a consistent concrete mix was used throughout). The radius at any point can then be evaluated from the temperature at that point by comparing it to the overall average temperature. The estimated caisson radius over the entire depth will be provided.

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THERMAL INTEGRITY PROFILER

4. Variations in temperature between sensors which could correspond to variations in cage alignment. When concrete volume is known, the estimated cage alignment or offset from center should be noted.

The effective radius is defined as the amount (i.e. radius) of intact competent concrete that would theoretically result in the measured temperature. The effective radius could be reduced due to the loss of concrete in a section or increased as a result of a poorly cemented mixture of concrete and/or debris. In either case, the absence of intact competent concrete can have a detrimental effect on strength and/or durability. The concrete condition rating criteria (CCRC) for evaluation of the concrete from the TIP tests shall be as shown on Table 503.12.02-1

TABLE 503.12.02-1
CCRC BASED ON TIP RESULTS

CCRC	Rating Symbol	TIP Test Results
Good	G	Effective Radius Reduction is Less Than 3%
Anomaly	Q	Effective Radius Reduction is Between 3% and 6%
Poor/Potential Defect	P/PD	Effective Radius Reduction is Greater Than 6%

(e) Correction of Unacceptable Caissons.

The Engineer will evaluate the integrity test results within 7 days of receipt from the Contractor and determine whether or not the caisson is acceptable. The acceptance of caissons will be based on the CSL and TIP results.

If CSL testing indicates that at least one profile (a profile is the result of the investigation from bottom to top between two inspection pipes) indicates a rating of P/PD that shall be considered a defect. The Engineer shall evaluate the zones that the CSL tomography results indicate a CCRC rating of Q and determine if the caisson indicates a defect.

If TIP testing indicates an area with a CCRC rating of P/PD that shall be considered a defect. The Engineer shall evaluate the zones that the TIP results indicate a CCRC rating of Q and determine if the caisson indicates a defect.

Caissons that indicate a defect shall be considered unacceptable unless:

1. The Structural Engineer and Geotechnical Engineer are both satisfied that the caisson with the defect present can support all structural loads with an acceptable factor of safety and that long term durability will be acceptable.

2. The Engineer determines that either the CSL or TIP tests are not indicative of conditions.

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Caissons that are unacceptable shall be cored or exposed to evaluate the quality of the concrete and caisson construction. One core sample shall be taken from each unacceptable caisson for the full depth of the potential defect and for 3 feet above and below the potential defect. Because it is desired to obtain a high percentage of core recovery for visual inspection and testing methods, the coring method and equipment shall provide for complete core recovery and shall minimize abrasion and erosion of the core. The Engineer shall approve of the coring procedure and methods before they are used.

An accurate log of cores shall be kept and the cores shall be placed in a suitable wooden crate and properly marked showing the caisson depth at each interval of core recovery. The cores along with 2 copies of the coring log shall be turned over to the Engineer for inspection and testing. If a defect is confirmed, the Contractor shall pay for all coring or excavation costs, including grouting of all core holes. If no defect is encountered, the Department shall pay for all coring or excavation costs, including grouting of all core holes.

When a caisson defect is confirmed, the Contractor shall submit a plan for remedial action to the Engineer. Materials and work necessary to complete corrections for defective caissons shall be furnished by the Contractor, at the Contractor's expense, and without an extension of the contract time.

Modifications to the caissons or load transfer mechanisms required by the remedial action shall be designed by a professional engineer registered in Colorado. The Contractor's remedial action plan shall include drawings stamped by the Contractor's engineer for all foundation elements affected. No remedial action work shall begin until the Contractor's remedial action plan has been approved by the Engineer.

Construction shall not proceed above the caisson until the quality of the concrete in the caisson, as represented by the core samples, is determined to be acceptable and notification to continue construction is given by the Engineer.

REVISION OF SECTION 504
CONCRETE PANEL FACING MSE WALL

Revision of Section 504 of the CDOT Standard Special Specifications is hereby revised for this project to include the following:

Replace 504.27 with the following:

504.27 Panel Facing Acceptance and Rejection. In this subsection, a "panel" refers to either a concrete panel or a hybrid unit. Each of the following shall be considered a defect:

(1) Dislocated Panel. A dislocated panel is an individual panel or its corner located outward more than ¼ inch from the adjacent panels.

(2) Cracked Panel. A cracked panel is an individual panel with any visible crack when viewed from a distance equal to the wall height in natural light.

(3) Corner Knock Off. A corner knock-off is a panel with any missing facial corners or architectural edges.

(4) Substandard panel. Substandard panels are concrete panels installed in any wall segments that do not meet the certified values for compressive strength. Each substandard panel counts as one defect.

(5) Oversize Joints. Panels with oversize joints are two adjacent panels that do not meet the required values in Subsection 504.07(f).

(6) Panels Failing the 10 Foot Straightedge Test. Straightedge test failures are joints that that deviate from even by more than ¼ inch when measured by placing a 10 foot straightedge across the joint.

Defects shared by two adjacent panels such as oversized joint, dislocated panel and panels not passing 10 foot straight edge test will be count as one defect.

In the completed wall, or completed portion of the wall the number of defects, as described above, in each 40 foot Section (horizontal or arc length) will be counted. If there are defects, the number of defects in the 40 foot Section will be considered for acceptance or rejection according to the table below. For panels with less than or equal to 3 in acceptance category, if the defects are repairable or the overall quality of wall can be improved, with the consent from the Engineer, the Contractor is required to repair for panel acceptance without any additional cost. A walkthrough inspection shall be made as requested by the Contractor before final payment.

No. of Defects in 40 Foot Section	< or = 3	> or = 4
% Of Price Reduction for that section	Acceptance	Rejection

When the number of defects exceeds 4, the entire wall or portions thereof shall be replaced.

REVISION OF SECTION 504
CONCRETE BLOCK FACING MSE WALL

Revision of Section 504 of the CDOT Standard Special Specifications is hereby revised for this project to include the following:

Replace 504.27 with the following:

504.27 Block Facing Acceptance and Rejection. In this subsection, "block" refers to either a concrete block or a hybrid unit.

(1) A dislocated block is where the edge of an individual block is offset outward more than ¼ inch or placed with a vertical joint more than ¼ inch from the edge of adjacent blocks.

(2) A cracked block is an individual block with any visible crack visible in natural light from a distance equal to the wall height.

(3) A corner knock-off is a block with any missing facial corners or any side longer than ½ inch at the corner.

(4) Substandard blocks are concrete blocks installed in any wall segments that do not meet the certified values of compression strength, water absorption rate, or freeze/thaw cycles; substandard blocks include blocks actually in the wall for which the Contractor does not provide reports and certifications as required in Subsection 504.12.

In the completed wall, or completed portion of the wall, if the number of defective blocks (cracked blocks, corner knock-off blocks, dislocated blocks, efflorescence or cement blemished blocks and substandard blocks) and blocks failing the straightedge test exceeds 6 percent of the total number of blocks in any wall segment of 40 foot horizontal or arc length. Rejection will be applied to that portion of the wall. For blocks subject to rejection, if the defects are repairable or the overall quality of wall can be improved, with the consent from the Engineer, the Contractor shall repair. A walkthrough inspection will be made as requested by the Contractor before final payment

% of Defective Blocks (x) in 40 foot section	$x \leq 6$	$6 < x$
Acceptance or rejection	Acceptance	Rejection

The acceptance or rejection shall be determined by dividing the sum of all defective blocks by the total number of blocks in that portion of the wall. When this percentage exceeds 6 percent, the entire wall or portions thereof are rejected and shall be replaced.

REVISION OF SECTIONS 509 & 708
PAINTING OF ALUMINIUM ACCESS DOORS FOR STEEL STRUCTURES

Sections 509 & 708 of the CDOT Standard Specifications are hereby revised for this project as follows: Subsection 509.24 shall include the following:

Aluminum access doors shall receive a solvent cleaning to remove grease, oil, etc.

(SSPC-SPI) followed by a brush blast to provide a profile similar to the structural steel. The access doors shall receive one coat of primer as described in the Revision of Section 708.03.

Subsection 708.03 shall include the following:

If Alternate 1, Alkyd System, is to be used on the structural steel, the aluminum access doors shall receive one coat of vinyl wash primer conforming to Mil-P-15328. Following the application of this primer, the doors will be painted the same as the structural steel (one field coat of primer followed by the top coat). Coating thicknesses shall be the same as specified for the structural steel.

If Alternate 2, Inorganic Zinc-Rich Polyurethane System, is used on the structural steel, the aluminum access doors shall receive one coat of vinyl wash primer conforming to Mil-P-15328. Following application of the vinyl wash primer, the same polyurethane top coat as used on the structural steel shall be applied to the access doors (minimum 3.0 mils dry film thickness).

The manufacturer of the primer shall certify in writing, that the primer used is compatible with the cleaned aluminum access doors and the polyurethane top coat to be used on the structural steel.

REVISION OF SECTION 509
LOCK-PIN AND COLLAR FASTENERS

Section 509 of the CDOT Standard Specifications is hereby revised for this project as follows:
Subsection 509.01 shall include the following:

High strength steel lock-pin and collar fasteners shall be used in unit #5N for all high strength bolts (those required to conform to the required to conform to the requirements of AASHTO M164 (ASTM A325)) specified.

Subsection 509.08 shall include the following:

The steel lock-pin and swaged collar fastener system shall conform to the materials, manufacturing, chemical composition and mechanical requirements (in full size tests) of AASHTO M164 (ASTM A325). The shank diameter and the bearing area under the head and swaged collar shall not be less than those provided by a bolt and nut of the same nominal dimensions prescribed in the requirements for "Heavy Hexagonal Structural Bolts" and for "Heavy Semi-Finished Hexagonal Nuts" given in ANSI Standard B 18.2.1 and B 18.22, respectively. Each fastener shall provide a shank body of sufficient diameter to provided tensile and shear strength equivalent to or greater than the bolt specified; shall have a cold forged head on one end of the type and dimensions specified, a shank length suitable for material thickness fastened, locking groves (all annular rings) on the opposite end. Each fastener shall provide a steel locking collar of proper size for shank diameter used, which by means of suitable installation tools, is cold swaged into the locking grooves forming a head for the grooved end of the fastener after the pull groove Section has been removed. The steel locking collar (the collar shall be of the flanged type) shall be a standard product of an established manufacturer of lock-pin and collar fasteners. The pin shall be specifically marked to identify the manufacturer.

The fasteners after installation shall conform to the following hardness requirements:

Hardness Number

Brinell		Rockwell C
Min.	Max.	Min.	Max.
248	311	24	33

All washers shall be hardened steel washers conforming to the requirements of AASHTO M293 (ASTM F436). The washers shall be specifically marked to identify the manufacturer.

Pin proof load tests (ASTM F606 Method 1) are required. Minimum frequency of tests shall be as specified in AASHTO M164 (ASTM A325) paragraph 9.2.4.

Wedge tests on full size pins (ASTM F606 paragraph 3.5) are required. If pins are to be galvanized, tests shall be performed after galvanizing. Minimum frequency of tests shall be as specified in AASHTO M164 (ASTM A325) paragraph 9.2.4.

Subsection 509.13 shall include the following:

The Contractor shall provide:

1. Mill Test Reports for all mill steel used in the manufacture of the lock-pin, flanged collars and hardened washers. The Mill Test Reports shall indicate where (city and state) the steel

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REVISION OF SECTION 509
LOCK-PIN AND COLLAR FASTENERS

was melted and manufactured. (All materials shall be of domestic origin as well as all subsequent processing.)

2. Mill Test Reports for all mill steel used in the manufacture of the lock-pin, flanged collars and hardened washers. The Mill Test Reports shall indicate where (city and state) the steel was melted and manufactured. (All materials shall be of domestic origin as well as all subsequent processing.)

3. The lock-pin and collar Manufacturer's Certified Test Report with the following:

The location where all of the lock-pin, collars and hardened washers were manufactured.

A statement that all the fasteners provided meet the requirements of this specification and the applicable requirements of AASHTO M164.

Results of the tests required in Subsection 509.08.

Delete Subsection 509.28(d) and replace with the following:

All field connections shall be made with high-strength bolts which include direct tension indicators. Direct tension indicators shall be either washer type direct tension indicators, tension control bolts or high strength steel lock-pin and collar fasteners.

Subsection 509.28(f) shall include the following:

The Contractor shall require a representative of the lock-pin and collar manufacturer to be on the project to train the steel erector's personnel in the proper installation of the fastener system. This representative shall be thoroughly familiar with the lock-pin and collar system and the required installation procedures and equipment.

Installation and tightening of each connection shall be done in the following manner:

Splice connections shall not be tightened until the entire continuous length of girder is in place on the substructure. One half the holes shall be filled with lock- pins and collars. Field splice elevations shall be verified prior to tightening. A hardened washer per ASTM F436 may be used under the pin head for joint thickness adjustment so that the installed fastener conforms to the Dimension "B", (See attached table).

Fasteners in all holes of the connection shall be initially brought to a snug tight condition (as defined in the attached table) progressing systematically from the most rigid part of the connection to the free edges in a manner that will minimize realization of previously tightened fasteners. The snug tight condition shall be verified on the calibration device prior to achieving the required final clamping force when testing for acceptance.

After all fasteners in the connection are snug tight, they shall be fully tightened, progressing systematically from the center most rigid part of the connection to its free edge.

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REVISION OF SECTION 509
LOCK-PIN AND COLLAR FASTENERS

After installation and tightening is completed each installed fastener shall be pinged with a hammer for soundness. Loose or rejected fasteners shall be removed and replaced with a new fastener. Each fastener shall be visually inspected in accordance with the attached table.

Subsection 509.28(h) shall include the following:

The Contractor shall provide a direct tension measurement device (Skidmore- Wilhelm Calibrator or an acceptable equivalent) for acceptance testing of the fasteners on the project and it shall have been certified by a testing laboratory within the last 6 months.

A representative sample (randomly selected) of three fasteners of each diameter, length and lot shall be tested by the Contractor in the tension measuring device.

The assemblies shall be snug clamped to approximately the value indicated in the following table prior to final clamping If any fastener fails to meet the required minimum tension (a pin tail brakes off before achieving the final clamping force) listed in the following table, the lot shall be rejected.

PIN DIAMETER (Inches)	SNUG CLAMPING(1) (Kips)	FINAL CLAMPING(2) (Kips)
3/4	5	29
7/8	7	41
1	9	54
1 1/2	14	108

1. Partially swaged collar, pintail still attached to pin.

2. Fully swaged collar, pintail pulled off.

REVISION OF SECTION 509
STEEL STRUCTURES

Section 509 of the CDOT Standard Specifications is hereby revised for this project as follows: Replace Subsection 509.08 with the following:

High Strength Bolts. All bolts used in fastening structural steel connections shall conform to the requirements of AASHTO M 164 (ASTM A 325), commonly known as High Strength Structural Bolts (HS). Heavy Hex Structural or Tension Control Bolts with suitable Heavy Hex Nuts and Plain Hardened Washers shall be provided. Type 1 bolts shall be provided for painted and Type 3 bolts for weathering (AASHTO M 222) structural steel. The length of bolts shall be such that the end of bolt will be flush with or outside the face of the nut when properly installed. Sufficient thread shall be provided to prevent the nut from encountering thread runout.

When the plans require bolts for structural steel connections to conform to the requirements of AASHTO M 164M (ASTM A 325M), bolts shall be substituted as outlined in the following table:

AASHTO M 164M	AASHTO M 164
Bolt Diameter	Bolt Diameter, Inch
M16	5/8
M20	7/8
M22	7/8
M24	1

The hardness for bolt diameters of 1/2 inch to 1 inch inclusive shall conform to the following:

BRINELL		ROCKWELL C	
Minimum	Maximum	Minimum	Maximum
248	311	24	33

Bolt proof load tests (ASTM F 606, Method 1) and wedge tests (ASTM F 606) on full size bolts are required. Minimum frequency of testing shall be as specified in AASHTO M 164.

All nuts shall be Heavy Hex and conform to the requirements of AASHTO M 292 (ASTM A 194), heat treated grade 2H, or AASHTO M 291 (ASTM A 563), heat treated grade DH. Proof load tests of all nuts in accordance with the requirements of ASTM F 606 are required. Minimum frequency of testing shall be as specified in AASHTO M 291 or AASHTO M 292.

All washers shall conform to the requirements of AASHTO M 293 (ASTM F 436). Compressible-Washer-Type Direct Tension Indicators, if used, shall conform to the requirements of ASTM F 959.

Rotational capacity (Lubrication) tests are required and shall be performed on all bolt, nut, and washer assemblies by the manufacturer or distributor prior to shipment to the project. Washers are required as part of the test. The rotational capacity tests shall be performed in accordance with the procedure defined in AASHTO M 164 and the following:

(a) Each combination of bolt production lot, nut lot, and washer lot shall be tested as an assembly.

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STEEL STRUCTURES

(b) A rotational capacity lot number shall be assigned to each combination of lots tested.

(c) The minimum frequency of testing shall be two assemblies per rotational capacity lot.

(d) The bolt, nut, and washer assembly shall be tested in a Skidmore- Wilhelm Calibrator or an acceptable equivalent device.

(e) The minimum rotation, from a snug tight condition (10% of the specified proof load), shall be:

1. 240 degrees (2/3 of a turn) for bolt lengths less than 4 diameters.

2. 360 degrees (1 turn) for bolt lengths greater than 4 diameters and less than 8 diameters.

3. 480 degrees (1 1/3 turns) for bolt lengths greater than 8 diameters.

(f) The tension reached at the above rotation shall be equal to or greater than 1.15 times the required installation tension. The installation tension and the tension for the turn test are shown below:

Diameter Inch	Installation Tension Kips	Turn Test Tension Kips
1/2	12	14
5/8	19	22
3/4	28	32
7/8	39	45
1	51	59

(g) After the required installation tension listed above has been exceeded, one reading of tension and torque shall be taken and recorded. The torque value shall conform to the following:

Torque = 0.25 PD Where:
Torque = Measured Torque (foot-pounds) P = Measured Bolt Tension (pounds)
D = Bolt Diameter (feet)

Bolts which are too short to be tested in the Skidmore-Wilhelm Calibrator may be tested in a steel joint. The Installation Tension requirements need not apply. The maximum torque shall be computed using a value of P equal to the Turn Test Tension.

Bolts, nuts, and washers (where required) from each rotational capacity lot shall be shipped in the same container. Each container shall be permanently marked with the rotational capacity lot number such that identification is possible at any stage prior to installation.

The Division's QA Inspector shall be provided with the following documents prior to shipment of structural steel to the project:

(h) Certified Mill Test Reports for all mill steel used in the manufacture of the bolts, nuts, and washers. The mill test report shall indicate where the material was melted and manufactured.

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STEEL STRUCTURES

(i) Certified Laboratory Test Reports for the following:

1. Bolt Hardness tests.

2. Bolt proof load tests.

3. Bolt wedge tests.

4. Nut proof load tests.

5. Rotational capacity tests.

Subsection 509.10 shall be replaced with the following:

Anchor Bolts. All anchor bolts with suitable hex nuts and plain hardened washers shall conform to the requirements of ASTM A 449 and shall be galvanized in accordance with the requirements of AASHTO M 232 (Class C) or zinc coated in accordance with ASTM B 695, Class 50.

Subsection 509.19(c) shall include the following:

Stiffeners shall not be mechanically forced into position.

Subsection 509.20(a) shall include the following:

Trapezoidal steel box girder fabrication:

1. The exterior web to flange welds on trapezoidal box members, in which the included angle is less than 90 degrees, shall be welded using the flux cored arc welding process (FCAW).

2. The interior web to flange welds, which have included angles greater than 90 degrees, may be welded by either the submerged arc welding process (SAW) or the flux cored arc welding process.

Subsection 509.21 shall include the following:

The field connections of all members (girders and diaphragms) of plate girder systems with a radius of less than 800 feet and steel box girder systems shall be assembled in the shop and the holes match drilled while the connections are assembled.

Shop assembly may be complete structure assembly or progressive structure assembly at the fabricator's option:

(a) Complete structure assembly shall consist of assembling all of the structural steel for the superstructure of the bridge.

(b) Progressive structure assembly shall consist of initially assembling part of two adjacent girder lines simultaneously. Each girder line shall consist of at least three girders. While blocked in position,

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STEEL STRUCTURES

the diaphragm and girder field splices shall be fitted and match drilled. At least one shop Section shall be added at the advancing end of a girder line and the next girder line started before any Section is removed from the rearward end.

All girders shall be oriented upright and blocked simultaneously in the position they will occupy on the bridge's substructure. All holes shall be drilled while the girders are blocked in this position. Marking holes to be drilled after the girders are moved is not allowed.

After the holes are drilled, all splice plates shall be positioned in their respective locations and pinned/bolted to demonstrate that the hole alignment through the multiple plate thicknesses is in accordance with the specifications. The Division's QA inspector shall be notified prior to disassembly to verify splice hole alignment. Verification of splice hole alignment shall not relieve the Contractor of the responsibility for proper fit up of the structural steel.

Quality Control shall measure flatness of the bottom flange at the bearing area. The bottom flange shall conform to the requirements of the Subsection 509.19(j). The Contractor's Quality Control Report shall list each bearing measurement.

Connecting parts assembled in the shop for field connections shall be match-marked, and two copies of a diagram showing each match-marked piece and defining how to use the marking system shall be provided to the Engineer 10 days prior to beginning structural steel erection.

The gap of abutting joints between members in a connection shall not exceed 3/8 of an inch.

Subsection 509.22 shall include the following:

The QA Inspector will perform Rotational Capacity and Verification Tests in accordance with the procedures outlined in the Report "High-Strength Bolts for Bridges" (Report No. FHWA-SA-91-031 May 1991, revised April 1992) on all lots used for shop connections.

Any rotational capacity lot that fails to conform to the requirements shall be rejected. Rotational capacity lots that fail may, at the Contractor’s option, be reprocessed and submitted for retest.

Bolt assemblies shall be installed in accordance with the procedures defined in Report No. FHWA-SA-91-031 May 1991, as revised April 1992.

Delete Subsection 509.24 (c) and replace with the following:

(c) *Paint System*. All structural steel, with the exception of weathering (AASHTO M 222), shall be painted with the two coat system defined in Subsection 708.03. Painting shall include a coat of primer on splice plates, faying surfaces of girders and diaphragms, and the interior surfaces of steel box girders. The primer and top coat shall be applied in the structural steel fabrication shop prior to shipment of the steel to the project site. The primer and top coat, color as defined in the plans, shall have a dry film thickness of 3.0 mils each. The Volatile Organic Content (VOC) of the paint shall not exceed 2.8 pounds per gallon (340 gm per liter). The QA Inspector shall be provided with a materials data sheet for all paint used on the project.

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STEEL STRUCTURES

Paint shall be stored, mixed, strained, and applied in accordance with the manufacturers application instructions. Quality Control inspections and tests shall be performed in accordance with the listed test. The Quality Control Inspector shall maintain a checklist of the pieces tested. Only deficiencies require measurement records. These records shall be forwarded to the QA Inspector.

The Contractor shall perform the test procedure ASTM D 4285 once every four operating hours to assure the absence of oil and moisture in the compressed air lines used to blast and paint.

The profile of surfaces to be painted shall be tested once every 2000 square feet (185 square meters). The procedure shall conform to ASTM D 4417.

The thinner used shall be that indicated in the Manufacturer's Technical Data Sheet. No material shall be substituted without approval. The maximum volume used in dilution shall not exceed the amount specified in the Technical Data Sheet.

The dry film thickness shall be measured to the frequency and using the procedure listed in The Structural Steel Paint Council Specification SSPC PA-2, with exception of diaphragms, bearings, and ancillary items. Ten percent of internal diaphragms in box girders, external diaphragms on all bridge girders, and ancillary items shall be spot measured (average to three readings). The Quality Control Inspector shall maintain a checklist of the members tested.

Replace Subsection 509.28 with the following:

509.28 Connections Using High Strength Bolts.

(a) *Field Connections*. Only Heavy Hex Structural Bolts with Compressible-Washer- Type Direct Tension Indicators or Tension Control Bolts conforming to the requirements of Subsection 509.08 shall be used in structural steel connections.

(b) *Bolted Parts*. Bolted parts shall fit solidly together when assembled and shall not be separated by gaskets or any other interposed compressible material. All joint faying surfaces, when assembled, shall be free of scale; dirt; burrs; drilling/cutting lubricants; other foreign material; and other defects that may prevent solid seating of the parts. Contact surfaces within joints shall be free of oil, paint (except primer coat), lacquer, or rust inhibiter.

(c) *Rotational Capacity and Verification Tests*. The Division will perform Rotational Capacity and Verification Tests in accordance with the procedures outlined in the Report "High-Strength Bolts for Bridges" (Report No. FHWA-SA-91-031 May 1991, revised April 1992) on all lots used for field connections. Any rotational capacity lot that fails to conform to the requirements shall be rejected. Rotational capacity lots that fail may, at the Contractors option, be reprocessed and submitted for retest.

(d) *Installation*. Bolt assemblies of appropriately assigned lot numbers shall be assembled together when installed in a joint. Fasteners and contact surfaces of splices shall be protected from dirt, moisture, and oil at the project site. Only as many fasteners as are anticipated to be installed and tightened during a work shift shall be taken from protected storage. Fasteners not used shall be returned to protected storage at the end of the shift. Fasteners shall not be cleaned of lubricant that

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REVISION OF SECTION 509
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is required to be present in as-delivered condition. Bolt assembly lots which are improperly stored, lack lubrication, or accumulate rust, dirt, or other contaminants shall be cleaned, relubricated, and submitted for retest as defined in Subsection 509.28(c).

Bolt assemblies shall be installed in and tensioned to the minimum tension specified in the following table:

Bolt Diameter Inch	**Required Minimum Bolt Tension Kips**
1/2	13
5/8	20
3/4	29
7/8	41
1	54

Bolt assemblies shall be installed in accordance with the procedures defined in the Report "High-Strength Bolts for Bridges" (Report No. FHWA-SA-91-031 May 1991, as revised April 1992.

(e) *Inspection*. The Contractor shall provide an acceptable platform from which the inspection of the bolt tension can be performed to determine whether the work meets the specification requirements. The Contractor shall inspect all fasteners to assure that the minimum bolt tension has been attained. All undertensioned bolt assemblies shall be brought into compliance.

(f) *Painting of Connections*. Structural steel connections in which all bolt assemblies have been satisfactorily tensioned shall be cleaned to remove the lubricant from the exposed portions of the fasteners and any other contaminants. The bolts and splice plates shall then be painted as defined in Subsection 509.24.

(g) *Repair of Painted Surfaces*. The Contractor shall repaint “touch up”, all areas in which the paint has been damaged. Tie downs and dunnage shall be cushioned to protect painted surfaces during transit. Repainting shall include all damage incurred during transit, handling, erection of structural steel, and forming and casting the deck. Paint shall conform to Subsection 708.03. Repainting will not be measured and paid for separately, but shall be included in the work.

REVISION OF SECTION 509
WELDING

Section 509 of the CDOT Standard Specification is hereby revised for this project as follows:
Subsection 509.20 shall include the following:

For field welding A7 steel, electrodes used shall be E7015, 16, 18, or 28.

For welding A7 steel with low-hydrogen electrodes by any process, the minimum preheat and interpass temperature shall be 150^0F for thicknesses of metal up to 1-1/2 inches.

Subsection 509.26 shall include the following:

The Contractor shall not commence any field welding on the girders until the Division's Materials Branch has been notified and their inspector is on the site. The preheating process shall be approved by the Division's inspector.

Subsection 509.20(h) shall include the following:

Base metal shall be preheated to 150^0F on the surface prior to welding studs.

REVISION OF SECTION 513
BRIDGE DRAIN

Section 513 is hereby added to the CDOT Standard Specifications for this project as follows:

DESCRIPTION

This work shall consist of furnishing and placing bridge drains in accordance with the details shown on the plans and the specifications.

MATERIALS

Pipe for bridge drains shall meet the requirements of ASTM A53 and shall be standard weight.

Down spout pipe shall be hot dipped galvanized after fabrication. Galvanizing shall meet the requirements of AASHTO M111.

Metal used in the manufacture of castings shall meet the requirements of ASTM A48 Class 35B.

CONSTRUCTION REQUIREMENTS

Bridge drains shall be placed and secured at the locations shown on the plans prior to placement of concrete.

Prior to fabrication of this item, two sets of working drawings which comply with the requirements of Section 105 shall be submitted to the Engineer for Information. The working drawings will not be approved or returned.

REVISION OF SECTION 515
CONCRETE SEALER (CALCIUM NITRITE)

Section 515 of the CDOT Standard Specifications is hereby revised for this project as follows:
Subsection 515.01 shall include the following:

This work consists of applying a penetrating corrosion inhibitor to finished surfaces of existing concrete or to cut surfaces of existing concrete prior to placement of new concrete. The corrosion inhibitor shall be placed under the direction of a manufacturer's representative in accordance with the manufacturer's instructions and as described herein.

Subsection 515.02 shall include the following:

The corrosion inhibitor shall consist of calcium nitrite and liquid carriers or penetrating vehicles, or organic inhibitors such as amino alcohols. The corrosion inhibitor shall conform to AASHTO M194, except for the requirements in tables 1, and 2, and sections 11 through 17. The corrosion inhibitor shall be one on the approved products list of the Division. If there are no approved products on the list the corrosion inhibitor shall be a product approved by the Engineer. If the plans specify the use of a calcium nitrite inhibitor, the inhibitor shall be calcium nitrite, if the plans specify the use of an organic inhibitor, an organic inhibitor shall be used. If the plans do not specify the type of inhibitor, either or both types of inhibitor may be used either individually or in combination, provided that the combination use is in accordance with the manufacturers recommendations.

Subsection 515.05 (a) shall include the following:

> Prior to the application of the corrosion inhibitor, surfaces to be treated shall be cleaned by air, sand, or water blasting and flushed with water until all material and contaminants which may interfere with the inhibitor's penetration have been removed.

Subsection 515.05 (b) shall include the following:

> The corrosion inhibitor shall be applied when the surface to be treated has been dry for at least 24 hours and above a temperature of 40F, or within a more restrictive temperature range if recommended by the manufacturer.

Subsection 515.05 (c) shall include the following:

> After the exposed surfaces have been prepared and allowed to dry, coats of corrosion inhibitor shall be applied in accordance with the manufacturer's recommendations. Each coat shall be evenly applied. Each application shall be allowed to dry prior to making the next application. Exposed surfaces shall be protected from precipitation and heavy dew during and after the application of the penetrating inhibitor. Traffic shall not be allowed on the treated surface until the corrosion inhibitor has penetrated the concrete and the liquid corrosion inhibitor is no longer visible on the surface. The Contractor shall follow all manufacturer’s recommendations, including penetration time, prior to opening treated surfaces to traffic or completing the work.
>
> Enough coats shall be applied so that each square yard of treated surface shall have absorbed 0.12 lb. of calcium nitrite or organic inhibiting agent. When treating areas from which deteriorated concrete has been removed, lap the treated area onto the adjacent surface at least 2’ beyond the removal

REVISION OF SECTION 601
PAINTING OF ALUMINUM ACCESS DOORS FOR CONCRETE STRUCTURES

Section 601 of the CDOT Standard Specifications is hereby revised for this project as follows:

Subsection 601.14(b)4 shall include the following:

> Aluminum access doors shall receive a solvent cleaning to remove grease and oil (SSPC-SPI) followed by a brush blast.
>
> The aluminum access doors shall receive one coat of vinyl wash primer conforming to Mil-P-15328. Following the application of this primer, the doors will be coated with Structural Concrete Coating conforming to Revision of Section 601 Structural Concrete Coating.
>
> The manufacturer of the primer shall certify in writing, that the primer used is compatible with the cleaned aluminum access doors and the Structural Concrete Coating to be used on the Structural Concrete.

REVISION OF SECTION 601
STRUCTURAL CONCRETE (GROOVED PATTERN FINISH)

Section 601 of the CDOT Standard Specifications is hereby revised for this project as follows:

Subsection 601.09 shall include the following:

An approved elastomeric form liner that will produce a grooved pattern finish shall be used in the designated portions of retaining walls. The form liner shall be furnished with a coating of an approved, non-petroleum base, factory-applied form release agent. After fastening the form liner to the form, an additional coat of manufacturer's recommended (only approved non-petroleum base may be used) form release agent shall be applied to the liner prior to and for each pour of concrete. Adjacent sections of the form liner shall be butted together to produce a good mortar tight joint. All grooves shall line up in the vertical direction. The form liner shall be securely fastened to the forms with staples or nails, or other approved methods.

Form ties shall be inserted through the form liner by cutting a cross-shaped slit in the liner. Prior to reuse of the form liner on adjacent wall sections, slits in the form liner that do not coincide with new tie spacing shall be sealed with a plastic tape which will adhere securely to the surface of the form liner.

The Contractor will be responsible to assure that whenever any discontinuances of the grooved pattern, or whenever any lines interrupting or intersecting the grooved pattern, are called for on the plans, that the resulting lines, horizontal, diagonal, vertical or otherwise, are neat and true, and that the form liner is not unduly deflected in any direction, including the form liner at the interface between the form liner and any other interrupting or intersecting line.

Subsection 601.09(f) shall include the following:

> Forms to which a form liner is to be attached shall not be treated with oil. Section 601.14(a) shall include the following:
>
> A grooved pattern surface finish as designated on the plans shall be used on the designated portions of concrete walls.
>
> The Contractor shall furnish samples at the job site measuring 4 feet by 10 feet for approval, at least two weeks prior to use. The final samples must receive the Engineer’s written approval before the finish can be incorporated into the work. These samples are to remain undisturbed on the project until project acceptance.
>
> For all walls or panels requiring a grooved pattern on the exposed surface which are less than 10 feet in height, the form liner producing the pattern shall be one continuous piece extending the full height of the wall or panel. For all other walls, no Section of the form liner may be less than 10 feet in height except for one Section which may be required to extend the form liner to full height.
>
> Horizontal joints in adjacent form liner sections shall be offset by no less than one foot vertically. The form liners shall be properly aligned to limit visible horizontal and vertical joints in the concrete.

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REVISION OF SECTION 601
STRUCTURAL CONCRETE (GROOVED PATTERN FINISH)

The required groove pattern finish shall extend from the bottom of wall or top of wall footing to the top of wall or bottom of wall coping or cap, or as otherwise shown on the plans. Grooves shall be continuous with no apparent curves or discontinuances. Variation of the groove from true vertical shall not exceed 1/4 inch for each 10 feet of wall height.

Concrete for such walls shall be poured monolithically vertically unless otherwise provided in the plans or permitted in writing by the Engineer. Concrete finish shall be in accordance with Revision of Section 601 - Structural Concrete Coating and shall be required for the full height of the grooved pattern finish to one foot below ground line.

Subsection 601.18 shall include the following:

Construction of grooved pattern surface finish on concrete walls will not be paid for separately but shall be included in the work.

REVISION OF SECTION 601
CONCRETE CLASS DT (DECK TOPPING)

Section 601 of the CDOT Standard Specification is hereby revised for this project as follows:

Subsection 601.16 shall include the following:

Concrete bridge deck overlays shall be cured according to the Revision of Section 601, Bridge Deck Concrete.

Subsection 601.17 shall include the following:

In the event that plastic shrinkage cracking has occurred, any cracks greater than 0.010 inch in width that develop within the first 5 days of overlay placement shall be assumed plastic shrinkage cracks. The cracks will be measured by the insertion of a wire gage at any time or temperature at 5 days. The Contractor shall make repairs by filling the cracks, concrete removal and replacement, or other methods.

A low viscosity two-part methacrylate or approved equal shall be used to fill cracks in accordance with the recommendations of the manufacturer of the crack filling material.

Those portions of the structure that have been overlaid with the Concrete Class DT shall not be opened to traffic, including construction traffic, for at least 5 days after overlay placement and until the concrete has reached compressive strength f c'.

Subsection 601.19 shall include the following:

Saw-cutting and sealing construction joints in bridge decks shall be included in the work.

REVISION OF SECTION 601 AND 708
STRUCTURAL CONCRETE STAIN

Section 601 and 708 of the Standard Specifications are hereby revised for this project as follows:

Subsection 601.01 shall include the following:

This work consists of: (1) Class 2 surface finish of concrete elements constructed under this Contract and designated to receive Structural Concrete Stain; (2) providing and applying an opaque Structural Concrete Stain to all concrete surfaces designated in the Aesthetic Design Standards for Central 70 in Schedule 10B Contract Drawings to receive a Structure Concrete Stain and (3) provide 5 gallons of pre-mixed touch-up stain in aerosol spray cans.

The color of the Structural Concrete Stain shall be as noted in the Aesthetic Design Standards for Central 70 in Schedule 10B Contract Drawings and shall be approved by the Engineer from test panels provided by the Contractor.

Subsection 601.03 shall include the following:

Structural Concrete Stain 708.08

Subsection 601.09(f) shall include the following:

> All concrete forms shall be treated with a water based concrete form release agent prior to placing reinforcement for surfaces to which Structural Concrete Stain is to be applied.

In Subsection 601.14(a), delete the third paragraph and replace with the following:

> Structural Concrete Stain shall be the final finish for all concrete surfaces designated on the plans and in these specifications prior to application of the Structural Concrete Coating (Anti-Graffiti).

Delete Subsection 601.14(b)4 and replace with the following:

> The Structural Concrete Stain shall be applied to all exposed concrete elements of the structure above the ground line, and shall extend 1 foot below the finished ground line. Bridge bearing devices, curb and barrier cover plates, fence, and steel bridge rail shall be masked or otherwise protected to prevent structural concrete coating from coming into contact with them.
>
> The color of the Structural Concrete Stain shall have the written approval of the Engineer prior to final batching and application on the project. The final color of the approved Structural Concrete Stain shall be determined as follows:
>
> (1) Two (2) foot by two (2) foot samples of the colors required by the contract shall be submitted to the Engineer for approval. The Stain samples shall be applied to a surface similar in texture to the concrete surface on which the Stain will be applied on the project. The Stain samples shall be applied by the same methods to be used in field application.

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REVISION OF SECTION 601 AND 708
STRUCTURAL CONCRETE STAIN

(2) At least three weeks prior to beginning of the application of the Structural Concrete Stain, one hundred (100) square foot test panels shall be prepared for the final color approval by the Engineer. The test panels shall be produced on the actual concrete surface on which the final product will be placed, at a location designated by the Engineer. The Stain shall be applied to the test panels by the same methods to be used in the final field application. The Engineer shall be allowed one week after application to the test panels for final review and approval.

Existing concrete designated to receive Structural Concrete Stain shall be cleaned by water blasting at a minimum pressure of 3,000 psi and at a rate of 4 to 14 gallons per minutes to remove dust, dirt, and other materials that would inhibit bonding of the coating. If the surface is contaminated before application of the coating, it shall be recleaned as required prior to application of the coating.

For concrete construction in this Contract, finishing and curing shall be completed in accordance with the specification prior to the application of the Stain. The concrete finish to which the Structural Concrete Stain is to be applied shall be a Class 2 Finish, except as modified below:

(1) Following curing of the concrete in accordance with Subsection 601.13, all projections and bulges shall be removed and the surface sandblasted. Sandblasting shall profile the concrete surface and remove all form release agents and all other deleterious materials that would inhibit the bond of the Structural Concrete Stain. The profile of the sandblasted concrete surface shall be equivalent to Concrete Surface Profile Three (CSP 3) as defined in Technical Guideline No. 03732, "Selecting and Specifying Concrete Surface Preparation for Sealers, coatings, and Polymer Overlays" by the International Concrete Repair Institute. The Contractor shall provide a CSP 3 chip for use on the project.

(2) A mortar mix, proportioned by volume, consisting of one part Portland cement, two to three parts sand (conforming to the requirements of ASTM C 144), and an approved bonding agent shall be used to patch all holes produced by form ties, honeycombing, voids 1/2 inch or larger in any dimension, broken corners and edges, and other defects. The mortar mix shall include an approved bonding agent. The quantity and application procedure of the bonding agent shall be in accordance with the recommendations of the manufacturer of the bonding agent. Areas to be patched shall be moistened with water before the mortar is applied and the patched area shall be float finished and left flush with the concrete surface without checking or cracking of patches. Patching shall be done when the ambient temperature is at least 40°F. Holes deeper than 3/4 inch shall be filled in layers that do not exceed 1/2 inch in thickness.

(3) Within 24 hours prior to applying Structural Concrete Stain, the concrete surface to be coated shall be cleaned by water blasting at a minimum pressure of 3,000 psi and at a rate of 4 to 14 gallons per minute to remove dust, dirt, and other materials that would inhibit bonding of the coating. If the surface is contaminated before application of the coating, it shall be recleaned as required prior to application of the coating.

New concrete shall be at least 28 days old or as approved in writing by the coating manufacturer before the Stain is applied.

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REVISION OF SECTION 601 AND 708
STRUCTURAL CONCRETE STAIN

Two coats of Stain shall be applied. Each coat shall be applied at a rate of 200 to 250 square feet per gallon (approximately 3 mils dry film thickness). The second coat shall not be applied until at least 12 hours after the application of the first coat.

If the surface is contaminated between coats, it shall be recleaned as stated above prior to application of the next coat.

The Stain shall be mixed mechanically and applied by spraying. Workmanship shall be such that the final stained surface is colored uniformly and presents a pleasing appearance. Any areas determined by the Engineer to be insufficiently stained shall be restained.

The Stain shall be applied only when the ambient temperature is between 50°F and 90°F and is anticipated to remain above 40°F for a minimum of 24 hours. Stain shall not be applied in windy or wet conditions or when rain or snow is expected within 24 hours. The surface to be stained shall be dry and free of frost.

Subsection 708.08 shall include the following:

708.08 Structural Concrete Stain. The stain shall be water-based acrylic microemulsionsiloxane solution containing not less than 15 percent solids by volume and not more than 210g/L VOC, or equal with Engineer's written approval.

All stain must be delivered to the project site in sealed containers bearing the manufacturer's original labels.

A material safety data sheet (MSDS) prepared in accordance with Federal Standard 313 and a complete set of manufacturer's mixing and application instructions shall be submitted to the Engineer before the Contractor begins applying the Stain.

REVISION OF SECTION 601
ANTI-GRAFFITI COATING

Section 601 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

Subsection 601.01 shall include the following:

This work consists of the application of a clear anti-graffiti coating to all exposed concrete surfaces including, but not limited to, retaining walls, wall caps, bridge girders, bridge rail, bridge abutments, and piers.

MATERIALS

Subsection 601.03 shall include the following:

The coating shall be "Acryli-Master" Anti-Graffiti Coating produced by TSW, Inc. or approved equal. The Contractor shall verify the compatibility of all concrete finishing products.

Approved equals shall be clear, water based, two component, cross-linked acrylic copolymer anti-graffiti coating. The anti-graffiti system shall create a seamless, breathable, crack-free, monolithic appearing surface and shall resist adverse effects from ultraviolet exposure, smog, sulfur dioxide, smoke, ozone, dirt, and other common urban pollutants.

As an alternative, and as approved by the Engineer, the Contractor may use a silicone based marine coating in lieu of the anti-graffiti coating. The silicone based marine coating shall create a seamless, breathable, crack-free, monolithic appearing surface and shall resist adverse effects from ultraviolet exposure, smog, sulfur dioxide, smoke, ozone, dirt, and other common urban pollutants.

CONSTRUCTION REQUIREMENTS

Subsection 601.14 shall include the following:

Application of anti-graffiti coating shall follow the completed application of stain, in accordance with Revision of Section 601 and 708, Structural Concrete Stain. All staining shall be accepted prior to the anti-graffiti coating application.

The coating shall be applied in accordance with the manufacturer's recommended procedures.

The coating shall be applied at the rate of approximately 600 square feet per gallon, per coat. A total of four coats is anticipated (or as recommended by the manufacturer).

Prior to application of anti-graffiti coating to the wall and bridge surfaces, the Contractor shall apply a complete coating system to two stained concrete samples, minimum 12 inches square. The samples shall be submitted to the Engineer a minimum of three weeks prior to the application of the coating.

Upon approval of the samples, and prior to the application of the anti-graffiti coating to the wall and bridge surface, the Contractor shall prepare a stained minimum 8-foot x 8-foot square mock-up panel and demonstrate anti-graffiti coating application. The Contractor shall then apply spray paint and permanent marker graffiti to the mock-up panel and demonstrate the actual graffiti removal process. The samples shall be approved by the Engineer a minimum of two weeks prior to applying the coating to the project.

REVISION OF SECTION 607
CONCRETE MASONRY SOUND BARRIER

Section 607 of the CDOT Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

This work consists of constructing a Concrete Masonry Sound Barrier in accordance with the plans and specifications.

MATERIALS

(a) General. References to the International Building Code (IBC) shall refer to the latest Edition. Laboratory technicians involved in masonry testing shall be certified by the National Concrete Masonry Association as a "Certified Laboratory Technician for Concrete Masonry". Technicians shall possess records of certification at all times when on site, during sampling of materials, preparation of test specimens, and while conducting tests.

(b) Concrete Masonry Units. Concrete masonry units (CMU) shall conform to the requirements of ASTM C 90 and the following:

1. Provide units that are Type II (non-moisture controlled), hollow, and normal weight.

2. The compressive strength of CMU'S shall be as defined in ASTM C 90 or greater as required to attain f'm.

3. Units shall be integrally and uniformly colored as defined in the plans.

4. Units shall be the size and surface texture defined in the plans.

5. Provide an approved water repellent additive in accordance with the manufacturers recommendations.

6. The Contractor shall sample and test CMU's in accordance with ASTM C 140 and provide the Engineer with complete test reports as outlined in Section 10 of C 140.

(c) Mortar. Mortar for concrete masonry construction shall conform to the requirements of the ASTM C 270 and the following:

1. Provide Type S in accordance with the Proportion Specifications for Portland Cement, lime, and sand. Masonry cement will not be allowed.

2. Quantities of sand, cement, and lime shall be accurately measured, shovel counts shall not be used.

3. Mortar shall be integrally and uniformly colored to match the CMU's.

4. Provide an approved water repellent additive in accordance with the manufacturers recommendations.

(d) Grout. Grout shall conform to the requirements of UBC Standard 21-19 and the following:

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REVISION OF SECTION 607
CONCRETE MASONRY SOUND BARRIER

1. A 28 day compressive strength of 2000 psi or greater as required to attain f'm. The Contractor shall sample and test the grout for every 5000 square feet of wall as construction progresses in accordance with the requirements of IBC Standard. Test reports shall be submitted to the Engineer as outlined in IBC.

2. Air is not required.

3. Up to 20% by weight of the cement may be an approved fly ash.

4. Fine aggregate shall conform to the requirements of AASHTO M 6 as defined in Section 703.

5. The coarse aggregate shall conform to the requirements of AASHTO M 43, Size 7 or 8, as defined in Section 703 and shall be a minimum of 50% of the total aggregate.

6. Sufficient water (or a combination of water and water reducer) shall be added to the grout to attain a slump of 8 to 10 inches prior to placement.

7. Provide an approved water repellent additive in accordance with the manufacturers recommendations.

(e) Prism Testing. The Contractor is responsible for providing a concrete masonry assemblage (a composite of CMU's, mortar, and grout) with a strength, f'm, of at least 2000 psi. Prism tests shall be conducted by the Contractor prior to starting and during construction to verify design compressive strength. Compressive strength of prisms shall be based on tests at 28 days and each set of prisms shall equal or exceed f'm. Compressive strength at seven days or three days may be used provided a relationship between seven-day and three-day and 28-day strength has been established for the project prior to the start of construction. Verification by masonry prism testing shall be as follows:

1. A set of five masonry prisms (grouted solid) shall be built and tested in accordance with IBC prior to the start of construction. Materials used for the construction of the prisms shall be taken from those specified to be used for the project.

2. A set of three prisms (grouted solid) shall be built and tested during construction in accordance with IBC Standard for each 5000 square feet of wall area, but not less than one set of three masonry prisms for the project. Prisms shall be constructed from materials randomly selected on the project site.

3. Test reports shall be submitted to the Engineer as outlined in IBC Standard.

4. Those portions of the wall represented by tested prisms that do not attain f'm shall be removed and replaced with a wall that meets the requirements of this specification at the Contractors expense.

(f) Masonry Reinforcement. Reinforcing Steel (Deformed Bars) shall conform to the requirements of Section 602 and shall be Grade 60.

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REVISION OF SECTION 607
CONCRETE MASONRY SOUND BARRIER

Joint reinforcement shall be provided every other coarse or as shown on the plans and shall be hot dipped galvanized in accordance with ASTM A 153-Class B-2, ladder type with 9 gage side and cross rods. Lap splices for joint reinforcement shall be a minimum of 6 inches.

1. Concrete Cap. Reinforcing Steel shall conform to the requirements of Section 602 and shall be Grade 60. Concrete shall conform to the requirements of Section 601 and the following:

2. Concrete shall be Class DT with a minimum cement content of 565 pounds per cubic yard.

3. Concrete shall be integrally and uniformly colored as defined in the plans.

4. The concrete cap can be either precast or cast-in-place.

(g) Water Repellent. An approved polymer water repellent shall be provided in all CMU's, mortar, and grout in accordance with the manufacturer's recommendations. The following polymer water repellent additives are approved:

Dry-Block by W.R. Grace.
Addiment Block Plus.

(h) Control Joints. Control joint material shall conform to the requirements of ASTM D 2000 2AA-805, ASTM D 1751.

CONSTRUCTION REQUIREMENTS

General. Construction of the concrete masonry walls shall conform to the requirements of the International Building Code (IBC), the plans and specifications.

Sample Approval. The Engineer shall approve in writing the following before concrete masonry wall construction begins:

Color and texture of concrete masonry units.

Four weeks before construction begins provide the Engineer with two concrete masonry units of each color and texture required on the project.

REVISION OF SECTION 607
FENCE CHAIN LINK SPECIAL

Section 607 of the CDOT Standard Specifications is hereby revised for this project as follows:
Subsection 607.02 shall include the following:

All materials shall meet the requirements specified in AASHTO M181 except as otherwise noted in the plans and these specifications. The Contractor shall provide certification from the manufacturer that all materials used are in compliance with the requirements of the plans and these specifications.

All material shall be galvanized. When required by the plans the fence shall also be vinyl coated. The color shall be as noted in the plans. All exposed materials shall have a uniform coloration. Temporary members and attachments that are to be removed need not be vinyl coated. The inside of pipes shall not be vinyl coated. When the fence is vinyl coated bolts and nuts shall be either vinyl coated or painted to match fence coating. Anchor bolts, threaded rods, anchor studs, post dowels, and other unexposed portions of anchorage assemblies shall be galvanized and not vinyl coated or painted.

The Contractor shall furnish to the Engineer for approval a 12" X 12" sample of the fabric (showing the exact coating and fabric construction to be used) and manufacturer's literature covering all aspects of the system he intends to install before ordering or fabricating any parts.

The fabric shall be AASHTO M181 Class C; or, when vinyl coating is specified in the plans, Class B. The mesh and wire sizes shall be as specified in the plans. When 10 mm (3/8") mesh with 12 gauge wire is specified in the plans the following properties shall apply.

For other mesh and wire sizes the properties shall be as specified by AASHTO M181.

Mesh	3/8" clear opening
Core wire breaking strength	650 lbs (minimum)
Core wire diameter	0.105 inch +/-0.005"
Galvanizing, Class C fabric	1.2 oz./sq. ft.
Galvanizing, Class B fabric	0.30 oz./sq. ft.
Vinyl Coating Class B Fabric	0.008 inch +/-0.002 inch

Tension wires shall be AASHTO M181 Type 1 Class 2; or, when vinyl coating is specified in the plans, Type 4.

Tension wires and their fittings shall have a minimum breaking strength of 1920 pounds.

Truss rods and their fittings shall have a minimum breaking strength of 3840 pounds for fences without horizontal members and with a minimum prestress force given by the plans.

Posts and horizontal members shall be standard or extra strong steel pipe, as noted in the plans, satisfying ASTM A53 Type E or S, Grade B (Fy = 35000 psi); or, at the Contractor's option, ASTM A466 Grade D pipe (50000 psi) minimum yield strength) conforming to the following table may be substituted for both the standard and extra strong pipe of the same outside diameter

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REVISION OF SECTION 607
FENCE CHAIN LINK SPECIAL

called for in the plans. All fittings and connections dependent on the pipe's inside diameter shall be modified as necessary for proper fit-up.

Alternative Pipe			
Nominal Diameter In.	Outside Diameter In.	Lb. Per Ft.	Wall Thickness In.
1.25	1.660	1.836	0.111
1.50	1.900	2.281	0.120
2.00	2.375	3.117	0.130
2.50	2.875	4.640	0.160

Stretcher bars, truss rods, tension wires, post tops, and other required fittings and hardware shall be commercial quality steel, or better, or cast or malleable iron as appropriate to the article. A pair of two tension wires with appropriate turnbuckles or other adjustment devices, may be substituted for each truss rod.

Post clips, wire ties, or hog rings shall be galvanized 9 gauge or 14 gauge (before galvanizing) steel wire, and vinyl coated when specified by the plans. Wire ties shall be given at least one complete turn. Ends of wire ties shall be directed away from traffic.

Subsection 607.03 shall include the following:

For fences without permanent horizontal members and with a minimum prestress force given by the plans, the following shall apply.

The total pretension force in the tension wires and the mesh combined shall not be less than the value shown in the plans. Each tension wire, truss rod, and the mesh should have some pretension and shall not be slack. This is to assure the strength and stiffness of the fence system under the anticipated loads.

The Contractor shall control the quality of the fence tensioning by checking that the deflection of the fence does not exceed the value shown in the plans when the test load described in the plans is applied. The Contractor may choose to assure this quality by observing these tests, or by performing tests of his own. If the deflection is excessive, the Contractor shall retension the fence components.

The temporary horizontal members shall be removed after the tensioning of the fence is accepted.

REVISION OF SECTION 618
PRESTRESSED CONCRETE

Section 618 of the CDOT Standard Specifications is hereby revised for this project as follows: In Subsection 618.04 replace the last sentence with:

The friction losses shall be determined in accordance with the plans and as provided for in the AASHTO LRFD Specifications for Highway Bridges.

Revise 618.06(b) 9 to read:

9. Copies of all concrete mix designs to be used, including mix design computations and test data, and acceptable specific gravities for mud balance tests, provided by the grout manufacturer.

Add 618.06(b) 14:

14. Post-tensioning system. Duct and anchorage inspection schedule, duct splices at closure pour inspection schedule, and duct pressure testing schedule, including name(s) of the of the responsible representative of the post-tensioning system supplier who will conduct inspections and testing.

Revise 618.06(c) to read:

Frequency. QC inspection and testing at all intervals of duct anchorage, duct splice operations, forming, tensioning, steel and concrete placement, curing, and storage operations shall be performed in accordance with the accepted QCP. The QCP shall contain provisions for increased frequencies of inspection and testing when operations or products do not conform to the Contract."

Add 618.06(d) 8:

8. Post-tensioning Ducts. The responsible representative of the post-tensioning system supplier shall submit to the QA Representative a letter certifying that the ducts, duct splices, and anchorages are installed according to the Contract and that they have been inspected by the responsible representative of the post-tensioning system supplier and adequately held an air pressure test of 45 psi.

Revise 618.07(a)7 to include:

The presence of rust on strand shall not necessarily be cause for rejection. Light rust and rust that does not result in visible pitting of the prestressing steel with the unaided eye shall be acceptable. Prior to evaluation, rust shall be removed from representative lengths of prestressing strand by heavy duty scouring pads, such as Scotchbrite by 3M. After rust removal, visual comparisons shall be made to picture sets in the article "Evaluation of Degree of Rusting on Prestressed Concrete Strand" published in the 1992

May-June edition of the PCI Journal. Surface conditions comparable to picture sets 1 through 3 shall be acceptable, while surface conditions comparable to picture sets 4 and greater shall be cause for rejection of the prestressing strand.

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REVISION OF SECTION 618
PRESTRESSED CONCRETE

Revise 618.07(c)(1)(4) to read:

(4) A grout manufacturer's field representative, who is a full-time employee of the grout manufacturer, will provide technical product assistance to the grouting crew, and will be present during start-up of grouting operations and be able to be present, should problems with the grout occur.

Revise 618.07(c)(1)(5) to include:

Be a full-time employee of the post-tensioning system supplier.

A holder of a current Grouting Training Certificate from the American Segmental Bridge Institute.

Revise 618.07(c) Item 9 of grouting plan to read:

9. Procedures for handling blockages, procedures and equipment required for flushing ducts of grout if necessary, and how and when it will be decided whether or not to flush ducts.

Add 618.07(c) Item 12 to grouting plan as follows:

12. List of production testing along with acceptable values. Subsection 618.07(c)2 (1) shall include:

    Alternative anchorages must be submitted and approved by the Engineer prior to the bid date. Alternatives submitted after this date will not be accepted.

Subsection 618.08 shall include:

Permanent anchorage grout caps are required and shall be installed before grouting begins. Anchorage devices shall have a minimum clear concrete or grout coverage of 2 inches in every direction unless otherwise shown in the drawings.

Replace the second paragraph of Subsection 618.09 (a) with:

The time from installing the prestressing steel in the ducts in an unstressed condition to grouting after stressing shall not exceed thirty days. The exceptions to the thirty day grouting requirement is during cold weather when heating would be required to allow the ducts to be grouted in accordance with (e) below, or if it is anticipated that a duct may not been grouted within 30 days after installing the tendon strands in the duct the Contractor will be allowed to place a 40 ft test strand into the sealed duct as a corrosion test strand that can be removed and evaluated for corrosion per Subsection 618.08(a)7. If the test strand method is used the Contractor shall install a test strand into a representative duct for each installation stage of tendons on the project. The test strand should pass through a local low point of the duct. If the Contractor chooses not to heat the structure, and the ducts have not been grouted within thirty days of installation of the prestressing steel in the ducts, the ducts shall be grouted the first day weather permits in accordance with (e) below.

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REVISION OF SECTION 618
PRESTRESSED CONCRETE

Subsection 618.09 (b) shall include:

The grout manufacturers lot definition in writing shall be included with the grouting plan. Table 618-1 Fluidity Test shall be revised as follows:

The minimum Efflux Time from Flow cone shall be 11 Seconds Minimum per ASTM C 939 test method.

The minimum Efflux Time from Flow cone shall be 5 Seconds Minimum per ASTM C 939 test method Footnote 3.

Revise Subsection 618.09 (d) to include:

Grouting. All grouting operations shall be performed under the immediate control of the representative of the post-tensioning system supplier.

The Contractor shall perform, or contract a commercial testing entity experienced with the following tests, and report the results to the Contractor's Engineer and the Engineer:

One pressure bleed test per day in accordance with the requirements of Appendix C of the "Specification for Grouting of Post-Tensioned Structures" by the Post-Tensioning Institute. The Gelman filtration funnel shall be secured vertically plump in a stand and shall be pressurized to 50 psi and the maximum percent bleed shall be zero when the vertical rise of ducts is greater than 6 ft, shall be pressurized to 30 psi and the maximum percent bleed shall be 2% when the vertical rise of ducts is greater than 2 ft and equal to or less than 6 ft, and shall be pressurized to 20 psi and the maximum bleed shall be 4% when the vertical rise of ducts is equal to or less than 2 ft.

Two mud balance tests per day or when there is a visual or apparent change in the characteristics of the grout in accordance with the API Recommended Practice 13B-1 "Standard Procedure for Field Testing Water-Based Drilling Fluids". Acceptable specific values for the grout shall be provided by the grout manufacturer and included with the grouting plan."

Replace the last sentence in Subsection 618.09 (d)(4) with: The efflux time shall be as shown in Table 618-1.

REVISION OF SECTION 618
SEGMENTAL PRESTRESSED CONCRETE STRUCTURES

Section 618 of the CDOT Standard Specifications is modified for post-tensioned elements for this project and replaced with the following:

Subsection 618.01 shall include the following:

This work shall consist of the construction of post-tensioned concrete members in accordance with these specifications and in conformity with the plan details.

This work shall include the stressing, furnishing and installation of any items necessary for the particular prestressing systems to be used, including but not limited to ducts, prestressing steel, anchorage assemblies, reinforcing for prestressing, and grout used for pressure grouting ducts.

The term "segment" refers to a modular Section of the superstructure consisting of the cross-Section detailed on the plans. The lengths of the segments are detailed on the contract plans.

The weight of each precast segment shall be as permitted for handling and transporting subject to Engineer's approval. The length of cast-in-place segments shall be the length between construction gaps shown.

The term "match cast" refers to a fabrication procedure whereby a segment is cast against the preceding segment. Match casting may be accomplished by either the short line casting method or the long line casting method.

Subsection 618.02 shall include the following:

All Duct splices shall use Shrink Sleeves or as approved by the Engineer. Subsection 618.03 shall include the following:

Post-tensioned members will be of the type, shape, and dimensions as shown on the plans.

The minimum strength of the concrete at the time of post-tensioning shall be 3500 psi or as given on the plans, whichever is greater.

Welds or grounds for welding equipment shall not be made on the forms or on the steel in the member after the prestressing steel has been installed, unless otherwise indicated on the plans.

The Contractor will not be allowed to deviate from the erection method or erection sequence, as shown on the plans. However, the Contractor may add temporary post-tensioning for purposes of erection or supporting construction loads.

The Contractor shall have available copies of all design information (calculations, computer output, etc.).

The Contractor shall submit drawings and calculations for the construction loading, if any, to which the bridge will be subjected during construction. These drawings and calculations shall:

Be prepared by an Engineer who is thoroughly knowledgeable in the design of post-tensioned concrete bridges.

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REVISION OF SECTION 618
SEGMENTAL PRESTRESSED CONCRETE STRUCTURES

Be in accordance with the current edition of the AASHTO LRFD Specifications for Highway Bridges.

Illustrate the configuration and magnitude of the construction loads. If the loads will vary during the phases of construction, then the details shall show the critical loads at each phase.

Verify that the stresses on the plans or contained in the specifications are not exceeded. In addition, joints with well distributed bonded reinforcing crossing them (as is typical in precast segmental construction) shall have no tension across them during construction or under service load after the structure is completed. The tension in any part of the prestressed concrete during construction shall not exceed 6(f'ci)1/2 or 3(f'ci)1/2 for the top of the deck. The tension in any part of the prestressed concrete under service load after the structure is completed shall not exceed 6(f'c)1/2 or 3(f'c)1/2 for the top of the deck.

Verify that the foundation or pier column capacities are not exceeded.

If the Contractor intends to add temporary post-tensioning he shall submit complete details and calculations in accordance with Subsection 618.03 (d) "Shop Drawings and Calculations" of this specification, for approval by the Engineer. The calculations shall meet the following requirements:

The calculations shall show that any stresses indicated on the plans or contained in these specifications are not exceeded, at any phase of construction.

The calculations shall consider all effects due to dead load, prestressing, and construction loads.

The calculations shall be prepared by an Engineer who is thoroughly knowledgeable in the design of post-tensioned, concrete bridges.

The calculations shall be prepared in accordance with the AASHTO Standard Specifications for Highway Bridges.

Temporary post-tensioning details shall meet the following requirements:

The temporary prestressing steel shall be clearly identified on the shop drawings.

The method, procedure, and sequence of tensioning and de-tensoning the temporary prestressing steel shall be shown. The sequence shall be related to the permanent post-tensioning.

Details shall show any ducts, blockouts, or buildouts necessary for the temporary prestressing steel. Ducts or voids internal to the member for temporary prestressing steel shall not be left void but shall be grouted in accordance with these specifications.

Stressing blocks for any temporary prestressing systems anchorages may be located within the slabs, in partial diaphragms within box girders, in external systems temporarily anchored to the girders and removed after used, or a combination of any of the above methods. All construction added outside a girder for temporary prestressing shall be subsequently removed to restore the girder to the designed cross-Section shown on the plans or as approved by the Engineer.

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REVISION OF SECTION 618
SEGMENTAL PRESTRESSED CONCRETE STRUCTURES

The detail requirements for the temporary post-tensioning shall be in accordance with 618.03 (d) "Shop Drawings and Calculations".

The Engineer shall review and approve the Contractor's construction loading and temporary post-tensioning details and calculations. If the details are not approved, they will be returned for corrections and resubmitted by Contractor, in the same manner as the first submittal.

The time required for approval of resubmittals will not be more than 5 weeks per submittal. It is the intent of these specifications that not more than two resubmittals will be required. If additional submittals are required by actions of the Contractor, the additional time required for review and approval will be borne by the Contractor.

Only after the Contractor's construction loading and temporary post- tensioning details and calculations are approved will the Division review final shop drawings for post-tensioning, bearing devices, falsework, or expansion devices for the superstructure. Approval of these details and calculations will not relieve the Contractor of the responsibility for the structural adequacy of the bridge, or the performance of the temporary post-tensioning, under construction loading.

REVISION OF SECTION 628
BRIDGE GIRDER AND DECK UNIT

Section 628 is hereby added to the CDOT Standard Specifications for this project as follows:

DESCRIPTION

This work consists of the design, fabrication, and erection of a simple span, welded self weathering steel, truss pedestrian bridge (with a timber or concrete deck) in accordance with the specifications and plan details.

Potential bridge suppliers are:

Continental Bridge
8301 State Highway 29 N
Alexandria, Minnesota 56308
1-800-328-2047, FAX 320-852-7067

Steadfast Bridges 4021 Gault Ave. South
Fort Payne, Alabama 35967
1-800-749-7515, FAX 256-845-9750

Excel Bridge Manufacturing Company
12001 Shoemaker Avenue
Santa Fe Springs, California 90670
562-944-0701, FAX 562-944-4025

Big R Manufacturing LLC
P.O. Box 1290
Greeley, Colorado 80632-1290
1-800-234-0734, FAX 1-970-356-9621

Wheeler Lumber, LLC 9330 James Avenue South
Bloomington, Minnesota 55431-2317
1-800-328-3986, FAX 952-929-2909

MATERIALS

Structural Steel. All structural steel shall be new (unused) material. The Contractor shall provide the Engineer and the Staff Bridge Branch Fabrication Inspection Unit with copies of all certified mill test reports for all structural steel and bolts. Floor beams, stringers, and members of each Half-through truss (upper and lower chords, diagonals, end posts and vertical posts) utilized in the bridges shall meet a longitudinal Charpy V-notch (CVN) value of 25 ft. lbs. at 40 degrees Fahrenheit. Testing shall be in accordance with AASHTO T 243 (ASTM A 673). The H frequency of heat testing shall be used. The Contractor shall provide the Engineer and the Staff Bridge Branch Fabrication Inspection Unit with certified copies of all CVN test reports.

All square and rectangular structural steel tubing shall conform to the requirements of ASTM A 847, Cold-Formed Welded and Seamless High Strength, Low Alloy Structural Tubing With Improved Atmospheric Corrosion Resistance.

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REVISION OF SECTION 628
BRIDGE GIRDER AND DECK UNIT

All structural steel shapes and plates shall conform to the requirements of ASTM A 588, High- Strength Low-Alloy Structural Steel.

All anchor bolts and nuts shall conform to the requirements of ASTM A 307, Grade A, Carbon Steel Bolts and Studs, and shall be galvanized in accordance with the requirements of ASTM A

153. Each anchor bolt shall be provided with two nuts for jamming.

All structural steel field connections shall be bolted with high strength bolts. High strength bolts, including suitable nuts and plain hardened washers, shall conform to the requirements of ASTM A 325. Bolts shall be Type 3.

Timber. All timber shall be new (unused) material and conform to either of the following:

> Southern Pine, No. 1 or better quality, Graded in accordance with Southern Pine Inspection Bureau (SPIB)rules.
>
> Douglas Fir-Larch, No. 1 or better quality, Graded in accordance with West Coast Lumber Inspection Bureau (WCLIB) rules.

All lumber shall be manufactured and inspected in accordance with the latest edition of Product Standard 20-70 as published by the Department of Commerce, and shall be grade marked or have an accompanying certificate from a certified grading agency. The grading agency shall be certified by the Board of Review of the American Lumber Standards Committee.

All timber shall be pressure treated, conforming to the requirements of the American Wood Preserver's Association (AWPA) Standards, Section C1 and C2 (Soil Contact). Either Ammoniacal Copper Arsenate (ACA) or Chromated Copper Arsenate (CCA) preservatives conforming to the requirements of Section P5 (Standards For Waterborne Preservatives) of the AWPA Standards shall be utilized and treatment shall be to a total absorption of 0.40 pounds per cubic foot of timber. A certified treatment report shall be provided to the Engineer and the Staff Bridge Branch Fabrication Inspection Unit.

CONSTRUCTION REQUIREMENTS

Design. The AASHTO LRFD Guide Specifications for the Design of Pedestrian Bridges shall govern the design. Bolted connections shall comply with Section 509 of CDOT Standard Specifications for bolting requirements.

The superstructure of the pedestrian bridge shall consist of two parallel Half-through trusses, or Pony trusses, with at least one diagonal per panel. The trusses shall be the main load-carrying members of the bridge.

The members of each Half-through truss, or Pony truss, (upper and lower chords, diagonals, end posts, and vertical posts) shall be fabricated from square and rectangular structural steel tubing.

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REVISION OF SECTION 628
BRIDGE GIRDER AND DECK UNIT

Floor beams and stringers shall be fabricated from structural steel shapes or square and rectangular structural steel tubing.

The structure shall conform to the clear span, clear width, and railing requirements shown on the plans.

Each pedestrian bridge shall be designed for the following loads and loading conditions:

Dead load shall be as defined in the AASHTO LRFD Guide Specifications for the Design of Pedestrian Bridges.

Live load shall be as defined in the AASHTO LRFD Guide Specifications. Distribution to the stringer and floor beams shall be in accordance with the AASHTO LRFD Guide Specifications for the Design of Pedestrian Bridges. Deflection and vibration limits as per the AASHTO LRFD Guide Specifications shall apply.

Pedestrian live load shall be as defined by the AASHTO LRFD Guide Specifications for the Design of Pedestrian Bridges.

Vehicle live load shall be as defined by the LRFD Guide Specifications for the Design of Pedestrian Bridges. When required by the plans, the vehicle live load shall be the Colorado Legal Load Type 3 Vehicle. This is a 27 ton, three axle, vehicle with 13.5’ front axle spacing and 4’ rear spacing. The axle loads are 7 tons on the front axle and 10 tons on each of the rear axles.

Wind load shall be as defined by the AASHTO LRFD Guide Specifications for the Design of Pedestrian Bridges.

Distribution of wheel loads on timber flooring shall be in accordance with the AASHTO LRFD Guide Specifications for the Design of Pedestrian Bridges.

Minimum thickness of structural steel shall be 3/16 of an inch.

½ inch diameter weep holes shall be drilled (flame cut holes will not be allowed) at all low points of all steel tubing members as oriented in the in-place, completed structure. In members that are level, or flat, a total of two weep holes shall be drilled, one at each end. Weep holes and their locations shall be shown on the Shop Drawings.

All metallic fasteners utilized in attaching timber to structural steel shall be galvanized.

All welded tubular connections shall be designed in accordance with Section 2, Parts A and D (Delete Subsection 2.36.6), of the Structural Welding Code-Steel ANSI/AWS/D1.1 (Latest Edition).

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REVISION OF SECTION 628
BRIDGE GIRDER AND DECK UNIT

When timber decking is used it shall be placed transverse to the trusses and have a minimum nominal thickness of 3 inches. Decking shall be securely fastened to each stringer and at each end to prevent warping.

Concrete and reinforcing steel, when used for the deck, shall conform to Sections 601 and 602, respectively.

The Contractor shall submit seven sets of Design Calculations and Shop Fabrication Details (Shop Drawings) to the Engineer for each pedestrian bridge separately. This submittal shall be in accordance with Subsection 105.02. The Design Calculations and Shop Drawings shall contain the endorsement seal of the Professional Engineer registered in the State of Colorado responsible for the design.

Shop Fabrication. Welding and fabrication of weathering steel pedestrian bridges shall conform to the requirements of the Structural Welding Code-Steel ANSI/AWS D1.1 (Latest Edition) as amended by the following:

As required in Subsection 4.7.3, a welding procedure shall be established by qualification in accordance with the requirements of Subsection 3.3 for the ASTM A 847 material used on the bridge. The results of the Procedure Qualification shall be recorded on Form E-1 in Annex E of AWS D 1.1.

The Contractor shall submit a Quality Control Plan. The Plan shall include personnel qualifications, certifications, and a Written Practice in accordance with ASNT SNT-TC-1A.

The quality of all welds shall be in accordance with Section 6, Table 6.1. In Table 6.1, Undercut 7(B), the criteria for primary members shall apply to the bottom chord members.

All Complete Joint Penetration Groove Welds in butt joints in the bottom chord members shall be 100% Magnetic Particle tested in accordance with ASTM E 709. Acceptance shall be determined in accordance with Section 6.10 and Table 6.1, using Alternating Current. In addition, complete joint penetration groove butt welds welded from one side without backing of bottom chord members shall be examined by ultrasonic testing in accordance with Section 6.11.1.

Magnetic Particle Testing shall be performed on 100% of all attachment welds to the bottom chord, using Alternating Current, in accordance with Section 6.10 and Table 6.1.

All Procedure Qualification Records and Welder Qualification Test Records shall be current within three years of the date of beginning fabrication.

A copy of all Procedure Qualification Records, Welder Qualification Test Records, Quality Control Plan and all visual and nondestructive test reports shall be provided to:

The Engineer.
Staff Bridge Branch Fabrication Inspection Unit
4201 E. Arkansas Ave., Room 330
Denver, Colorado 80222

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REVISION OF SECTION 628
BRIDGE GIRDER AND DECK UNIT

All weathering steel shall be blast cleaned, Steel Structures Painting Council Surface Preparation No. 6 (SSPC-SP6, Commercial Blast Cleaning), to remove mill scale and foreign material which would prohibit rusting to a uniform color.

Field Construction. The substructure shall be constructed in accordance with the details shown in the plans and the pedestrian bridge shop drawings. Before construction begins on the substructure, the Contractor shall determine the anchor bolt requirements and substructure dimensions needed to properly erect the structure which will be provided. The Engineer and the Department shall be provided with two copies of detail sheets delineating these requirements before work begins.

14. LANDSCAPING AND AESTHETICS

14.1. General

The Developer shall design and construct all landscape and aesthetic Elements of the Project in accordance with the requirements of this Section 14.

14.2. Applicable Standards and Drawings

All Construction Work required to be performed by the Developer pursuant to this Section 14 shall comply with the Construction Standards (including the sections of the CDOT Standard Specifications listed in Section 14.8.1), the relevant requirements listed in this Section 14, Good Industry Practice, and the following documents:

a. Local Agency Municipal Codes and Ordinances as applicable to the Project;

b. Swansea Elementary School requirements specified in the DPS MOA;

c. I-70 Cover Plans included in Schedule 10B Contract Drawings;

d. I-70 Cover and Swansea Elementary School Outdoor Areas Design Narrative included in Schedule 10B Contract Drawings;

e. Denver Parks and Recreation (DPR) Planning, Design + Construction Standards

f. City of Denver Building Code, Policies, and Guidelines;

g. Approved Street Tree List for the City of Denver's public Rights-of-Way;

h. Denver Public Schools Design and Construction Standards;

i. Denver Public Schools Educational Specifications;

j. CDOT's Environmental Stewardship Guide;

k. CDOT Landscape Architecture Manual;

l. National Electrical Code;

m. The Denver IGA;

n. Aesthetic Design Standards for Central 70 included in Schedule 10B Contract Drawings; and

o. Denver Public Works Ultra-Urban Green Infrastructure Guidelines.

14.3. Administrative Requirements

14.3.1. Landscaping and irrigation in Local Agency Roadway areas shall be designed and constructed to the Local Agency standards.

14.3.2. The Developer shall obtain a tree removal permit from CCD-Forestry for the removal of any trees within the Denver ROW.

14.3.3. With the exception of the I-70 Mainline, I-225 and I-270, Local Agency standards shall also be applied to all CDOT Roadways between the back of curb and the Right-of-Way (ROW) line.

14.3.4. The landscape and aesthetics designs and plans shall be prepared by a Registered Landscape Architect in the State of Colorado.

14.3.5. Public Art

a. The Developer shall not preclude the installation of public art features during design or construction in the following locations:

i. Bridge gateways at Brighton Boulevard, York Street, Josephine Street and Fillmore Street as identified in the Aesthetic Design Standards for Central 70 included in Schedule 10B Contract Drawings

ii. Mural wall located along the eastern portion of the Cover as identified in the I-70 Cover Plans included in Schedule 10B Contract Drawings;

iii. Neighborhood-facing side of the noise walls as identified in the Aesthetic Design Standards for Central 70 in Schedule 10B Contract Drawings; and

iv. School-facing side of the temporary wall at Swansea Elementary School as identified in DPS Temporary Wall Exhibit included in the Reference Documents.

b. The Developer shall work with the Department through a public art selection process pursuant to which artists will be commissioned to produce features at the locations identified in this Section 14. The Developer shall provide input on durability and maintenance of artworks during the selection process, and constructability during the design process.

14.4. Design Requirements

14.4.1. Deterrence of Vandalism and Unauthorized Use of Facilities

The landscape and hardscape design shall discourage vandalism and discourage dwelling and the storage of personal items within the Site. All plantings shall use open-branch trees and shrubs that will minimize the collection of trash and debris. All plantings shall be designed and spaced to provide a safe space that deters unlawful behavior.

14.4.2. Irrigation

The Developer's design shall provide irrigation and power supplies and other services required for the landscaping, including separate metered service and central control systems for each maintaining entity e.g. Cover Top Maintainer (Planning Area 2), Swansea Elementary School Outdoor Areas (Planning Area 1), Local Agency maintained areas, and Developer/Department maintained areas.

14.4.3. Utility Service

The Developer shall provide all required utility services with meters in accordance with the requirements of this Section 14 and Schedule 10, Section 4 Utilities. Separate metered electrical service shall be provided for each maintaining entity e.g. Cover Top Maintainer (Planning Area 2), Swansea Elementary School Outdoor Areas (Planning Area 1), Local Agency maintained areas, and Developer/Department maintained areas.

14.4.4. Landscape Design

The landscape design shall accommodate the categories as described below. The Developer's Landscape Plans shall include a schematic drawing of the Project showing where each category of landscaping is proposed.

a. Corridor Non-Irrigated Areas

These areas shall include plants which, once established, shall not require supplemental water from irrigation. Within Local Agency areas, the landscaping shall comply with Local Agency standards. The locations of these areas are shown in the Corridor Landscape Exhibit included in the Reference Documents. Within the legend of the Corridor Landscape Exhibit they are described as "Remnant Parcels, Native", "Non-irrigated Native", "Non-irrigated Native with Trees", and "Detention Pond". Corridor native areas also consist of all areas of the Site which are not otherwise specified as "Premium Landscape" areas, "Enhanced Landscape" areas or the Cover, and shall be revegetated to corridor non-irrigated standards, as described in this Section 14.

b. Corridor Irrigated Landscape Areas

These areas include irrigation, plantings, and additional landscape enhancements to promote pedestrian movement along the corridor, especially in the areas adjacent to the Cover. The locations of these areas are typically within Local Agency ROW, CDOT ROW which falls under an IGA with a Local Agency, or adjacent to private property where the Local Agency requires the property owner to maintain enhanced landscaping. The locations of these areas are shown in Corridor Landscape Exhibit included in the Reference Documents. Within the legend of Corridor Landscape Exhibit they are

described as "Premium Landscape" and "Enhanced Landscape", and includes some areas near the Cover shown as "Hardscape".

c. Cover (including Planning Area 1 and Planning Area 2)

This area shall require landscape, irrigation, aesthetics, playground facilities, parking lot, and miscellaneous park features in these areas conforming to the specific design requirements as described in this Section 14. This Section 14 references a number of program areas at the Cover and Swansea Elementary School outdoor areas – boundaries of which can be found on sheet L0-02 in the I-70 Cover Plans included in Schedule 10B Contract Drawings. The descriptions of the intent of these areas can be found in the I-70 Cover and Swansea Elementary School Outdoor Areas Design Narrative included in Schedule 10B Contract Drawings. Areas include the following:

i. Swansea Elementary School;

ii. Multi-Use Field;

iii. Central Plaza Space;

iv. Events Lawn;

v. Tot Lot and Splash Pad;

vi. Concessions/Restroom Building;

vii. East Side Community Space;

viii. Columbine Street Cover Extension;

ix. Clayton Street Cover Extension; and

x. 46th Avenue, Columbine Street and Clayton Street Streetscapes.

For certainty, when the term Corridor is used in this Section 14 it shall refer to both Corridor Non-irrigated Areas and Corridor Irrigated Landscape Areas (as described in this Section 14.4.4) unless otherwise specified.

14.5. Cover and Swansea Elementary School Outdoor Areas - Landscape and Aesthetic Design and Plans

14.5.1. The Developer shall be responsible for designing and constructing all aspects of the Cover, including Planning Area 1 and Planning Area 2.The I-70 Cover Plans included in Schedule 10B Contract Drawings (including the landscaping and aesthetic features reflected in such plans) constitute preliminary 70% design of the Cover and Swansea Elementary School outdoor areas and have been preliminarily agreed by the City of Denver and the Department. The Developer shall be required to advance and complete such design in accordance with the requirements of this Agreement.

14.5.2. Denver Public Schools will complete a temporary reconstruction of the existing playground and parking lot as shown in the DPS Phase 3 Exhibit provided in the Reference Documents while school is not in session during Summer 2018.The Developer's construction work within the Swansea Elementary School Outdoor Areas (Planning Area 1) is not allowed while school is in session (between first day of school in August to last day of school near the end of May, as defined by the Denver Public Schools school year calendar for the appropriate year). Section 14.5.17 shall apply to construction work activities affecting the Swansea Elementary School Outdoor Areas (Planning Area 2). The Developer shall coordinate with Denver Public Schools in relation to the scheduling of all construction activities on the Cover. The Developer shall provide access to school personnel who are accessing the school. During the non-student contact days prior to the start of the first semester in any school year, the Developer shall provide sufficient parking and access for returning teachers, support staff, and visitors. Upon initiation of construction of Cover Planning Area 1, the work shall be complete before the first day of the first semester in the relevant school year.

14.5.3. The Developer shall prepare the Landscape and Aesthetics Plans for the Cover (Planning Area 1) in conformance with Denver Public Schools Design and Construction Standards. The Developer

shall coordinate the design with Denver Public Schools and obtain approval of the preliminary plans prior to submittal to the Department and approval of the final (100%) plans prior to submittal to the Department.

14.5.4. All Construction Work required to be performed by the Developer for the Cover pursuant to this Section 14 shall comply with the relevant requirements of this Section 14 including Appendix A and Appendix B and Good Industry Practice.

14.5.5. The Developer prepared Preliminary Landscape and Aesthetics Plans for the Cover and Swansea Elementary School outdoor areas as part of its Proposal. The Developer shall use the Proposal submittal as a basis to prepare and submit Preliminary Landscape and Aesthetics Plans for Acceptance by the Department. The Preliminary Landscape and Aesthetics Plan submittal shall include as a minimum the following narratives and plans:

a. Narrative of the Developer's design process to be completed and approach to achieving the vision set forth for the space both in program and character.

b. Narrative and plans that outline the opportunities and constraints in the design and construction Elements.

c. Narrative and plans for the cross streets, Columbine, Clayton, and 46th Avenue, depicting the character and context of how they relate to the Cover and Swansea Elementary School outdoor areas landscaping and aesthetic designs.

d. Narrative and plans related to the coordination and integration of other disciplines including structures, the Cover MEP System, drainage, roadway, utilities, and lighting.

e. The Developer shall provide visual renderings that show the proposed designs. A minimum of one rendering for each of the 14 identified Program Areas described in the Cover and Swansea Elementary School Outdoor Areas Design Narrative, included in Schedule 10B Contract Drawings, is required. Renderings include 3D images, sketches or models at a scale to depict overall design intent as well as scale and material selection.

f. The Developer's Preliminary Landscape and Aesthetics Plans shall include plans, elevations, sections, perspectives, isometric drawings, details, etc., as necessary to fully convey the proposed Cover and Swansea Elementary School outdoor areas landscape and urban designs including color and texture applications; drawings, tables and schedule that show where specific Elements are located; and plant palette schedules, size, number, location of trees, shrub beds, accent beds, and planning types.

g. The Developer's landscape and aesthetics work shall include underground permanent irrigation systems to maintain plant material in accordance with DPR Planning, Design + Construction Standards.

14.5.6. The Developer shall prepare and submit the Cover and Swansea Elementary School outdoor areas - Final Landscape and Aesthetics Plans to the Department for Acceptance. The final plans shall address all comments and include all Accepted elements of the Cover and Swansea Elementary School outdoor areas – Preliminary Landscape and Aesthetic Plans.

14.5.7. The Developer shall provide adequate levels of lighting on the Cover to enhance safety and security, promote responsible use of program areas, and serve aesthetic compatibility with surrounding uses.

a. Lighting Typologies

i. Requirements for multi-use field lighting are as follows:

A. Poles

(I) Maximum height of field lighting poles shall not exceed 70 feet.

(II) Maximum number of field lighting poles shall not exceed four.

(III) Optimize the location of field lighting poles.

B. Lighting Fixtures

Maximum number of light fixtures shall not exceed 36 fixtures.

C. Field Lighting Design

(I) Average of 30 foot-candles across the field play surface.

(II) Meet IESNA Standards for safe play.

D. Spill Light

(I) Horizontal spill: Maximum of 0.10 foot-candles spill light at 150 feet from field boundary.

(II) Vertical spill: Maximum 0.10 foot-candles spill light at 150 feet from field boundary.

E. Glare Light

2072 candelas at 150 feet from boundary.

ii. Requirements for pedestrian lighting of 46th Avenue, Columbine Street and Clayton Street streetscapes (refer to CCD standards for street lighting requirements) are as follows:

Spacing, Location and Fixture Height

All streetscapes along the Cover are to provide pedestrian-scale lighting fixtures along sidewalks at intervals not less than 60 feet within the amenity zone and outside of the clear pedestrian zone. Fixture heights shall be between 12 feet and 15 feet. Glare Control full cut-off fixtures shall be provided within the guidelines of “Dark Sky” policies. A single fixture type is to be selected for these areas, and is to include keyless entry.

iii. Requirements for lighting of internal Cover areas, not including the multi-use field, are as follows:

A. Paved walkways in open space areas shall be illuminated with a minimum maintained 0.5 foot-candles of light on the walking surface during the hours of operation and a minimum one hour thereafter. After-hours illumination may be reduced 50%.

B. Stairways shall be illuminated with a minimum one foot-candle of light on all landings and stair treads, during the hours of operation and a minimum of one hour thereafter.

C. Parking lots and walkways accessing buildings and parking areas shall be illuminated with a minimum maintained one foot-candle (maximum eight foot-candles) of light on the driving or walking surface.

D. Splash pads, tot lots and playground activity areas shall be illuminated with a minimum maintained one foot-candle of light.

E. Luminaires utilized to meet the requirements of this Section 14 shall have vandal resistant light fixtures, if accessible, and be not less than 12 feet in height from ground level. A luminaire not less than 42 inches may be utilized to illuminate a walkway if adjacent landscaping is of a variety which does not mature higher than two feet, and it does not interfere with the required light distribution for a distance of 16 feet along the walkway. Light fixtures shall be deemed accessible if mounted within 15 feet vertically or 6 feet horizontally from any accessible surface or any adjoining roof, balcony, landing, stair treads, platform or similar structure.

F. Not more than one fixture is to be used for each of the following lighting types:

(I) Parking lot lighting;

(II) Pedestrian lighting;

(III) Central Plaza lighting;

(IV) Field lighting;

(V) Accent lighting;

(VI) Tree accent lighting;

(VII) Building-mounted lighting.

G. Activation of the required exterior lighting shall be either by a photocell device or a time clock with an astronomic clock feature and/or photocell.

H. As part of the Cover and Swansea Elementary School outdoor areas plan deliverables, provide a site plan showing buildings, parking areas, walkways, detailed landscaping and a point-by-point photometric calculation of the required light levels. Foot-candles shall be measured on a horizontal plane and conform to a uniformity ratio of four to one (4:1 average/minimum).

I. Restroom designs shall be naturally lighted during the day and artificially illuminated no later than dusk and turned off no later than two hours after curfew hours

b. Lighting Product Requirements

i. All lighting products provided for the Cover shall be LED luminaries and shall incorporate the most recent technology to ensure adequate lighting levels and lower maintenance needs.

ii. All pedestrian scale lighting posts along streetscapes or in program areas on the Cover are to include adjustable banner arms. The lower banner arm shall be mounted at a minimum height of eight feet.

iii. Separate lighting controls shall be provided for all lighting within each program area listed below:

A. Events lawn;

B. Central plaza space, including a separate lighting controls for the pavilion stage;

C. Tot lot and splash pad;

D. East side community space;

E. Multi-use field; and

F. Swansea Elementary School outdoor areas; lighting controls shall be designed and constructed in order for Swansea Elementary to control the lights individually.

14.5.8. Shade Coverage and Tree Planting

a. The Developer shall provide shade coverage on the Cover, with the expectation that there is a combination of natural shade (provided by tree canopy) and manufactured shade (provided by permanently installed overhead structures) and that the approach to tree planting maximizes the use of areas to be shaded. Tree locations shall be in accordance with the I-70 Cover Plans included in Schedule 10B Contract Drawings. Minor adjustments to tree locations are allowed to optimize the structural design.

b. The Developer shall provide the minimum soil depth and soil volume as depicted on the Planting Plans included in the I-70 Cover Plans provided in Schedule 10B Contract Drawings.

c. All shade trees, ornamental trees and evergreen trees are to include permanent tree anchors.

d. Assumptions

i. The Developer shall use the following assumptions in the calculation of shaded areas defined in the tiers below. Due to the nature of the Cover planting environment, it shall be assumed that trees planted on the Cover will not reach expected full maturity sizes. The following are to be considered average mature canopy widths of trees over structure:

A. Shade trees: 24' canopy 10 years after installation;

B. Ornamental trees: 16' canopy 10 years after installation; and

C. Evergreen trees: do not contribute to shade coverage, but should be considered for planting diversity.

ii. When calculating shade coverage, credit shall not to be given twice to areas in which individual shade elements overlap. Shade coverage calculations are to be provided by the Developer at time of Deliverable(s).

iii. Shade coverage shall be determined through a straight 2D plan surface calculation.

iv. All natural shade provided by tree canopy will be dictated by the City of Denver Forestry's tree planting standards and requirements. Minimum sizes and species of trees shall be provided in accordance with these standards and requirements.

e. Shade Coverage and Tree Planting

i. Requirements for the multi-use field are as follows:

A. Shade Coverage

Trees shall be planted at a minimum of 30 feet on center adjacent to the Columbine Street sidewalk.

B. Tree Planting Approach

(I) Trees are to be located in raised planters with a maximum of 30 inches in height as related to surrounding paved/field surfaces.

(II) Shade trees are to comprise a minimum of 75% of trees planted adjacent to Columbine Street.

ii. Requirements for the central plaza space are as follows:

A. Shade Coverage

(I) 50% at tree canopy maturity.

(II) Minimum of 50% shall be natural shade.

(III) Shade coverage shall be clustered and dispersed so as to create large canopies of shade in areas of high use.

(IV) A minimum of one shade structure shall be provided in the central plaza area, providing a minimum of 1,000 square feet of shade coverage.

B. Tree Planting Approach

(I) Trees shall be located in raised planters with a maximum of 24 inches in height as related to surrounding paved surfaces.

(II) Shade trees shall comprise a minimum of 75% of trees planted in the central plaza area.

iii. Requirements for the tot lot and splash pad are as follows:

A. Shade Coverage

(I) 40% at tree canopy maturity.

(II) Minimum of 50% shall be natural shade.

(III) Shade coverage shall be clustered and dispersed so as to create large canopies of shade in areas of high use.

(IV) A minimum of one shade structure shall be provided in the tot lot and splash pad area, providing a minimum of 1,000 square feet of shade coverage.

B. Tree Planting Approach

(I) Trees adjacent to the tot lot and splash pad shall be located in raised planters with a maximum of 24 inch in height as related to surrounding paved surfaces.

(II) Shade trees shall comprise a minimum of 75% of trees planted in the tot lot and splash pad area.

iv. Requirements for the east side community space are as follows:

A. Shade Coverage

(I) 35% at tree canopy maturity.

(II) Minimum of 50% shall be natural shade.

(III) Shade coverage shall be clustered and dispersed so as to create large canopies of shade in areas of high use.

(IV) A minimum of one shade structure shall be provided in east side community space, providing a minimum of 1,000 square feet of shade coverage.

B. Tree Planting Approach

(I) Trees within landscaped areas shall be located in raised planters with a maximum of 30 inches in height as related to surrounding paved surfaces.

(II) Trees within the plaza area adjacent to the events lawn shall be planted a grade with the surrounding pavement.

(III) Shade trees shall comprise a minimum of 65% of trees planted in the east side community space.

v. Requirements for the events lawn are as follows:

A. Shade Coverage

(I) 20% at tree canopy maturity.

(II) Minimum of 40% shall be natural shade.

(III) Shade coverage shall be located at the perimeter of the space.

(IV) A minimum of one shade structure shall be provided at the west extents of the events lawn to protect the stage area from sun and natural elements, providing a minimum of 2,500 square feet of shade coverage.

B. Tree Planting Approach

(I) Shade trees shall be used within the perimeter of the events lawn and shall be planted in raised planters with a maximum height of 30 inches relative to the lowest adjacent surface.

(II) Shade trees shall be planted adjacent to the concession/restroom building, and shall be located in raised planters with a maximum height of 12 inches as related to surrounding paved surfaces.

(III) Ornamental trees shall be used at the transition of the events lawn to the east side community space, and shall be located in raised planters.

vi. Requirements for the 46th Avenue, Columbine Street and Clayton Street streetscapes are as follows:

A. Shade Coverage – 46th Avenue, Columbine Street and Clayton Street streetscapes

Trees shall be planted at a minimum of 30 feet on center adjacent to all street frontages.

B. Tree Planting Approach – 46th Avenue Streetscape

(I) Shade trees shall be used along all street frontages.

(II) East of Thompson Court (46th Avenue and Clayton Street), all streetscape trees shall be planted in raised planters with a maximum height of 12 inches as related to surrounding paved surfaces.

(III) West of Thompson Court (46th Avenue and Columbine Street), all streetscape trees shall be planted in raised planters with a maximum height of 30 inches as related to surrounding paved surfaces.

C. Tree Planting Approach – Columbine Street Streetscape

(I) Shade trees shall be used along all street frontages.

(II) All streetscape trees shall be planted in raised planters with a maximum height of 30 inches as related to surrounding paved surfaces.

D. Tree Planting Approach – Clayton Street Streetscape

(I) Shade trees shall be used along all street frontages.

(II) All streetscape trees shall be planted in planting areas flush with surrounding paved surfaces.

vii. Requirements for Swansea Elementary School (playground) are as follows:

A. Shade Coverage

(I) 25% coverage at tree canopy maturity.

(II) Minimum of 50% shall be natural shade.

(III) A minimum of three shade structures totaling and minimum of 1200 square feet shall be provided within the playground space.

B. Tree Planting Approach

(I) Shade trees shall be used within play areas and at the perimeter of the playground; trees planted at the perimeter of the

playground may be planted at grade with adjacent pavement or in raised planters, trees planted internal to the playground shall be planted in raised planters.

(II) A mix of ornamental and evergreen trees shall be used within garden areas.

viii. Requirements for Swansea Elementary School (parking lot) are as follows:

A. Shade Coverage

A minimum of one shade tree per every five parking spaces shall be provided in planting islands separated by curbs from adjacent pavement

B. Tree Planting Approach

Shade trees shall be used within planting islands in the parking lot.

14.5.9. Understory Planting

a. The Developer shall provide cover planting schemes with respect to material types, landscape maintenance, and character.

b. All understory planting material will be dictated by the City of Denver Forestry's planting standards and requirements. Height restrictions and species of planting will be provided in accordance with these standards and requirements.

c. Understory Planting Material Tiers

i. Tier 1 – Naturalized Turf: Tier 1 includes areas intended for full access to active and passive use of landscaped areas, and include the events lawn and open lawn (within the east side community space). The following requirements shall be followed in irrigated turf areas:

A. Provide low water-use, high-traffic turf sod adapted to the local climate.

B. Annual maintenance to be provided at regular weekly intervals during the growing season.

C. Permanent irrigation shall be provided, and shall incorporate advanced technologies in turfgrass irrigation to mitigate evaporation; irrigation product preferences are to match Denver Parks and Recreation (DPR) Planning Design + Construction Standards.

ii. Tier 2 – Transition Landscapes: Tier 2 areas include landscaped areas between program area uses on the Cover (multi-use field, central plaza space, events lawn, and east side community space). Transition landscapes also include landscaped areas within streetscapes and internal Cover program areas, transition landscapes at the ends of the Columbine Street cover extension and Clayton Street cover extension and landscaped areas within the Swansea Elementary School outdoor areas. The following requirements apply to transition landscapes:

A. Materials in transition landscapes shall provide definition and scale to transition areas on the Cover; attention is to be given to plant material massing and seasonal interest.

B. Hardy, drought-tolerant shrub, ornamental grass and hardy perennial plantings shall comprise a minimum of 80% of plant materials.

C. A massed-planting approach shall be applied for ease of maintenance and for aesthetic appeal.

D. Maintenance shall be provided on a semi-annual basis (spring pruning and fall clean-up) at a minimum during the growing season.

E. Weed removal shall be provided on a regular basis during the growing season.

F. Permanent irrigation shall be provided; drip irrigation is not to be used; irrigation product preferences are to match Denver Parks and Recreation (DPR) Planning, Design + Construction Standards.

iii. Tier 3 – Enhanced Landscapes: Tier 3 areas include entry gardens, passive garden areas and focal nodes on the Cover as identified in the I-70 Cover Plans included in Schedule 10B Contract Drawings. The following requirements apply to enhanced landscapes:

A. Materials used in enhanced landscapes shall vary in size, color, texture and bloom time for four-season interest.

B. A combination of hardy, drought-tolerant shrub, ornamental grass and perennial planting shall comprise a minimum of 60% of plant materials. A maximum of 40% of plant materials may be accent or annual planting.

C. Planting arrangements may be formal or informal.

D. Maintenance shall be provided on a regular basis during the growing season (pruning, dead-heading, weeding, etc.).

E. Permanent irrigation shall be provided; drip irrigation is not to be used; irrigation product preferences are to match Denver Parks and Recreation (DPR) Planning, Design + Construction Standards, and require separate meters and central control systems.

14.5.10. Permanent irrigation designs

The Developer's permanent irrigation designs shall use:

a. products with low precipitation rates that will allow water to slowly infiltrate into the soil and be more readily available for plants;

b. fertigation (the injection of fertilizers, soil amendments, and other water-soluble products into an irrigation system) to achieve higher fertilization needs required for vegetation growing within engineered media;

c. soil moisture sensors to manage the soils properly and ensure that excess water is not being applied or that the soils are not drying out too quickly; and

d. green infrastructure so that plant material can be watered with natural rainfall.

14.5.11. Site Furnishings Locations and Counts

The Developer shall provide the following items, all of which shall comply with the relevant specifications set out in Appendix B to this Section 14, in the areas specified in this Section 14.5.11.

a. Benches

i. 46th Avenue Streetscape: Provide a minimum of six backless benches located along north side of sidewalk between Columbine Street and Thompson Court;

ii. Tot Lot and Splash Pad: Provide a minimum of two backed benches located adjacent to tot lot; and

iii. East Side Community Space: Provide a minimum of two backed benches located within playground area.

iv. Swansea Elementary School Playground: Provide a minimum of three backed benches located throughout the playground area.

b. Bike Racks

i. Tot Lot and Splash Pad: Provide bike rack(s) that accommodate a minimum of 12 bikes and shall be located adjacent to the parking area; and

ii. Columbine Street: Provide bike rack(s) that accommodate a minimum of 20 bikes and shall be located along east side of Columbine Street.

c. Trash/Recycling Receptacles

i. Style 1: Standard

A. Central Plaza Space: Provide one trash and recycling receptacle located within the northwest seating area;

B. Tot Lot and Splash Pad: Provide one trash and recycling receptacle adjacent to tot lot; and

C. East Side Community Space: Provide one trash and recycling receptacle adjacent to playground space.

D. Swansea Elementary School Playground: Provide a minimum of three trash receptacles located throughout the playground.

ii. Style 2 – Solar-Powered Compacting

A. Central Plaza Space: Provide one solar-powered compacting trash and recycling receptacle located within the southwest seating area;

B. Tot Lot and Splash Pad: Provide one solar-powered compacting trash and recycling receptacle adjacent to west or south side of concession building; and

C. Events Lawn: Provide one solar-powered compacting trash and recycling receptacle located at the northeast entrance stairs and provide one solar-powered compacting trash and recycling receptacle located at the southeast entrance stairs.

d. Tables and Chairs

i. Central Plaza Space:

A. Provide a minimum of six embedded or surface mount tables with a minimum of 24 embedded or surface mount chairs within northwest seating area; and

B. Provide a minimum of three embedded or surface mount picnic tables within southwest seating area.

ii. Tot Lot and Splash Pad:

Provide a minimum of six embedded, surface mount or movable tables with a minimum of 24 movable chairs adjacent to concession/restroom building.

iii. East Side Community Space:

Provide a minimum of three embedded or surface mount tables with a minimum of 12 embedded or surface mount chairs adjacent to playground area.

e. Tree Grates

East Side Community Space:

Provide a minimum of five tree grates to be located where trees are planted at grade with surrounding paved surfaces between the events lawn and the open lawn/playground areas.

f. Removable Bollards

i. Swansea Elementary School outdoor areas:

Provide a minimum of three removable bollards located to the south of the sidewalk south of the Swansea Elementary School parking lot, on axis with the central plaza space corridor to the south.

ii. Central Plaza Space:

Provide a minimum of three removable bollards located on the south entrance of the central plaza space along the 46th Avenue streetscape.

g. Drinking Fountain

Concession/Restroom Building:

Provide a minimum of one drinking fountain to be provided on the south side of the concession/restroom building.

h. Fences

i. Fencing shall completely enclose the multi-use field, with five gate openings as described in the I-70 Cover Plans included in Schedule 10B Contract Drawings and the I-70 Cover and Swansea Elementary School Outdoor Areas Design Narrative included in the Schedule 10B Contract Drawings; and

ii. Fencing shall completely enclose the Swansea Elementary School, with four gate openings as described in the I-70 Cover Plans included in Schedule 10B Contract Drawings and the I-70 Cover and Swansea Elementary School Outdoor Areas Design Narrative included in Schedule 10B Contract Drawings.

14.5.12. Splash Pad

The Developer shall design and construct the splash pad in accordance with the I-70 Cover Plans included in Schedule 10B Contract Drawings and the I-70 Cover and Swansea Elementary School Outdoor Areas Design Narrative included in Schedule 10B Contract Drawings.

14.5.13. Tot lot

The Developer shall design and construct the tot lot in accordance with the I-70 Cover Plans included in Schedule 10B Contract Drawings and the I-70 Cover and Swansea Elementary School Outdoor Areas Design Narrative included in Schedule 10B Contract Drawings.

14.5.14. Multi-Use Field

The turf supplied and installed by the Developer for the multi-use field shall comply with the relevant specifications set out in Appendix B to this Section 14.

14.5.15. Electrical

a. Cover electrical requirements shall be in accordance with the I-70 Cover Plans included in Schedule 10B Contract Drawings and the I-70 Cover and Swansea Elementary School Outdoor Areas Design Narrative included in Schedule 10B Contract Drawings. The Developer's Construction Work shall include:

i. Pavilion structure at Events Lawn (High Power Capacity): The pavilion structure stage shall provide electrical power supply and power outlets for a variety of programing appropriate for a pavilion/stage:

A. Movies in the Park – Power and electrical outlets for screen, sound, to allow for movie in the park events;

B. Music Concerts – Power and electrical outlets to support small music concerts, speakers, soundboards, etc.;

C. Small Theatrical or Similar Performances – Power and electrical outlets to supply speakers, soundboard, and temporary lighting track for performance.

ii. Central Plaza Space (Medium Power Capacity) – Power and electrical outlets shall be provided within the main plaza area to meet the anticipated programing events within the plaza space. The electrical outlets shall be controlled so that power can be turned on/off as required by the Cover Top Maintainer. Examples of programming events to be provided for include:

A. Weekend or Evening Market – Electrical outlets to allow for tent vendors to plug in and draw power for smaller appliances, lighting, or other appropriate electrical needs for a small temporary vendor display;

B. Small Stage Podiums– Electrical outlets to support small portable stage, speakers, soundboards, etc.

iii. Concession/Restroom Building (Medium Power Capacity) – Power and electrical outlets shall be provided to the concession building and restrooms to meet both the electrical requirements of the building itself (restrooms, lighting, etc.) and to provide sufficient electrical capacity for additional programming or ad-hoc uses such as:

A. Small Concessionaire – Electrical outlets shall provide sufficient capacity for appropriate uses of a small concessionaire such as refrigeration, small stove, heating, or other electrical appliances that allow for food/beverage preparation;

B. External Outlets – The building shall include external electrical outlets for routine maintenance activities and other ad hoc needs. The electrical outlets shall be controlled so that power can be turned on/off as required by the Cover Top Maintainer.

iv. Streetscape Outlets (Low Power Capacity) – Electrical outlets shall be installed at the planter boxes around the external boundary of the Cover sidewalks and around the Events Lawn. The electrical outlets shall be controlled so that power can be turned on/off as required by the Cover Top Maintainer, as well as a setting that is triggered by light sensor. These outlets should allow for following uses:

A. Tree lighting – Festival or holiday lighting around trees;

B. Maintenance – Allow for manual power to outlets so that outlets can be used for various maintenance purposes (power tools, yard tools, etc.).

b. As part of the Cover (including Planning Area 1 and Planning Area 2) plan deliverables, the Developer shall provide electrical plans.

14.5.16. Security Cameras

a. The Developer shall provide full security camera coverage for the I-70 Cover (Planning Area 2) and Swansea Elementary School Outdoor Areas (Planning Area 1).

b. Security cameras shall have wireless connectivity with a signal receiver located within an area which has the ability to receive all camera signals for each Planning Area. Provide fiber lateral, conduit, pull boxes, cabinets, splicing, and all other necessary system components. Signal receiver shall be connected to CCD's fiber network as described in Schedule 10 Section 3 (ITS And Tolling). Security cameras shall be in accordance with Revision of Section 614 – CCD Traffic Surveillance Camera provided in Schedule 10 Section 11.

c. Areas of camera coverage shall be provided for safety and security. Security camera coverage is not required separately for the signalized intersections surrounding the Cover

as coverage will be provided with the traffic signals. The areas in need of coverage are as follows:

i. All entrances and exits to the I-70 Cover (Planning Area 2) and Swansea Elementary School Outdoor Areas (Planning Area 1);

ii. Central Plaza Space;

iii. School Parking and Drop Off;

iv. Play Courts and Playgrounds;

v. An overview of the Multi-Use Field;

vi. Tot Lot and Splash Pad;

vii. Concession/Restroom Building;

viii. An overview of the Events Lawn;

ix. East Side Community Space; and

x. Traffic Operation cameras will cover the intersections around the cover.

14.5.17. Temporary Wall at Swansea Elementary School

The Developer shall design and construct a temporary wall between I-70 and Swansea Elementary School for use during the Construction Period. The wall shall be in place prior to initiation of any Construction Activities within 200 feet of the school ROW (other than constructing the temporary wall itself). The location and limit of the temporary wall are shown in the DPS Temporary Wall Exhibit provided in the Reference Documents. The wall shall provide visual screening and reduce noise and dust at the school. The wall shall be constructed of a material that has a minimum density of four pounds per square foot of wall surface area. The wall shall be 12 feet tall and constructed without open joints or gaps. The temporary wall shall remain in place until the Cover Planning Area 2 (as depicted in the I-70 Cover Plans) is open to the public.

14.5.18. Buildings

The Developer shall design and construct all buildings in accordance with the I-70 Cover Plans included in Schedule 10B Contract Drawings and the I-70 Cover and Swansea Elementary School Outdoor Areas Design Narrative included in Schedule 10B Contract Drawings, including the concession/restroom building and maintenance buildings.

14.6. Corridor Landscape Design and Plans

14.6.1. Existing Site Inventory

The Developer shall prepare plan sheets and supporting data which document the existing landscape conditions and irrigation system facilities present on the Site. These documents shall be designated as the Existing Site Inventory. The Developer shall submit the Existing Site Inventory to, and obtain Acceptance thereof from, the Department prior to the issuance of NTP2. The Existing Site Inventory shall be prepared in accordance with the CDOT *Landscape Architecture Manual*, Appendix 5 – Landscape Plan Development. In addition, the Existing Site Inventory shall include:

a. Locations of wetlands, SB40 Areas and riparian areas; the locations formally landscaped areas; the locations of irrigated areas, and the locations of other non-paved areas. All areas shall have a description of the existing vegetation and conditions;

b. An inventory of all trees with a diameter two inches or greater at breast height in SB40 areas. An inventory of all trees with a diameter of four inches or greater at breast height in all other areas. An inventory of shrubs including species and square footage of coverage in all areas;

c. Vegetation location and identification (including photo documentation), including species, location, condition, size, health, and a recommendation for remaining undisturbed, pruning, removal, transplanting, or replacement;

d. Summary of data collected in the vegetative cover transects completed for the water quality requirements;

e. Details of landscapes and irrigation systems impacted by the Project; and

f. Locations of protected areas and description of protected resource.

14.6.2. Corridor Irrigated Areas

a. Irrigation

i. The Developer shall coordinate with adjacent property owners who have existing landscaped property and irrigation systems that are impacted by the Work. In impacted areas located east of Colorado Boulevard the Developer shall tie into the existing irrigation system and install new irrigation where the Local Agency requires landscaping and maintenance (e.g. tree lawns). New material shall be used to provide irrigation coverage to these areas. The Developer shall install landscaping, including grass, trees, and irrigation systems, in these areas as required by Local Agency standards.

ii. Irrigation systems for “Premium Landscape” areas and ”Enhanced Landscape” areas west of Colorado Boulevard (including Colorado Boulevard itself) shall be supplied with water and power from taps and power sources which will be owned by the Local Agency. The Developer shall provide the taps, meters, and power sources as required for the Work. The Developer shall install landscaping, including grass, trees, and irrigation systems, in these areas as required by the Local Agency Standards. The median areas on Brighton Boulevard, Steele/Vasquez, Colorado Boulevard and Quebec Street as shown in Corridor Landscape Exhibit are included in this requirement.

b. ”Premium Landscape” Areas

i. Requirements for pedestrian lighting of 46th Avenue (between York Street and Milwaukee Street), York Street, and the Local Agency Roadways over I-70 Mainline (York Street, Josephine Street and Fillmore Street), (refer to CCD standards for street lighting requirements) are as follows:

Spacing, Location and Fixture Height

All streetscapes within the “Premium Landscape” areas are to provide pedestrian-scale lighting fixtures along sidewalks at intervals not less than 60 feet within the amenity zone and outside of the clear pedestrian zone. Fixture heights shall be between 12 feet and 15 feet. Glare Control full cut-off fixtures shall be provided within the guidelines of “Dark Sky” policies. A single fixture type is to be selected for these areas matching the fixture selected for the Cover.

ii. Requirements for 46th Avenue (between York Street and Milwaukee Street), York Street, Josephine Street, Columbine Street (outside of the Cover), and Clayton Street (outside of the Cover), streetscapes are as follows:

Tree Planting Approach

A. Street trees shall be used along all street frontages.

B. Street trees shall be planted at a minimum of 30 feet on center adjacent to all street frontages, with secondary ground covers and shrubs.

C. Street trees shall be planted in raised planters with a maximum height of 16 inches as related to surrounding paved surfaces excluding hardscape areas. The raised planters shall integrate benches/seat walls with a minimum 16” high seat wall height along the sidewalk side.

D. Street trees shall be planted within the hardscape area adjacent to 46th Avenue (south of the Cover) at a minimum of 30 feet on center in a tree trench with tree grates.

E. Electrical outlets shall be installed at the planter boxes and tree grates. The electrical outlets shall be controlled so that power can be turned on/off, as well as a setting that is triggered by light sensor. These outlets should allow for following uses:

(I) Tree lighting – Festival or holiday lighting around trees;

(II) Maintenance – Allow for manual power to outlets so that outlets can be used for various maintenance purposes (power tools, yard tools, etc.).

iii. Requirements for 46th Avenue (south of the Cover) and York Street hardscape areas are as follows:

A. The hardscape areas should integrate creative, hardscape paving strategies.

B. The hardscape areas shall integrate pedestrian refuges with benches/seating accommodations.

c. "Enhanced Landscape" Areas

i. Requirements for pedestrian lighting of the Local Agency Roadways over I-70 Mainline (Steel/Vasquez Blvd., Cook Street, Monroe Street, and Colorado Blvd.), (refer to CCD standards for street lighting requirements) are as follows:

Spacing, Location and Fixture Height

All Local Agency Roadways over I-70 Mainline within the "Enhanced Landscape" areas are to provide pedestrian-scale lighting fixtures along sidewalks at intervals not less than 60 feet within the amenity zone and outside of the clear pedestrian zone. Fixture heights shall be between 12 feet and 15 feet. Glare Control full cut-off fixtures shall be provided within the guidelines of "Dark Sky" policies. A single fixture type is to be selected for these areas, and is to include keyless entry.

ii. Requirements for Brighton Blvd., Vine Street (between High Street and Gaylord Street), and east of Colorado Boulevard, streetscapes are as follows:

Tree Planting Approach

A. Street trees shall be used along all street frontages.

B. Trees shall be planted at a minimum of 35 feet on center adjacent to all street frontages, with secondary ground covers and shrubs.

14.6.3. Corridor Non-irrigated Areas

In the Corridor Native Areas the Developer shall provide and install grass, plants, and trees in accordance with the applicable Local Agency Standards or the CDOT Standard Specifications and CDOT Landscape Architecture Manual. The Developer shall maintain all vegetation in the Corridor Non-irrigated Areas until the end of the Landscape Warranty Period.

i. "Non-irrigated Native with Trees" and "Detention Pond" areas.

Tree Planting Approach

A. Shade trees shall be used along all street frontages and along the perimeters of all detention/water quality ponds.

B. Trees shall be planted at a minimum of 35 feet on center adjacent to all street frontages, with secondary ground covers and shrubs.

ii. "Remnant Parcels, Native", "Non-irrigated Native", and "Detention Pond" areas

All areas shall be revegetated and established with the appropriate proposed seed mix.

14.6.4. Corridor - Preliminary (30% Level) Landscape Plans

The Developer shall prepare and submit the Corridor - Preliminary (30% level) Landscape Plans to the Department for Acceptance. The Corridor – Preliminary Landscape Plans shall be prepared in accordance with the CDOT *Landscape Architecture Manual*, Appendix 5 – Landscape Plan Development. In addition, the Corridor – Preliminary Landscape Plans shall include the following:

a. The landscape design;

b. Locations, mitigations, removals, and replacements of trees, shrubs, landscapes and irrigation impacted by the Project;

c. Proposed locations of replacement or proposed transplanted vegetation within the Site;

d. Proposed tree species for the I-70 Mainline, I-225 and I-270 based on the species and conditions as outlined by the State's portion of the FHWA The Roadside Use of Native Plants;

e. Proposed tree species for Local Agency landscaping areas. The Developer shall comply with Local Agency requirements;

f. Proposed seed mixes including common name, botanical name, pounds pure live seed per acre, and seeds per square foot for each species;

g. Description of how landscape designs will be coordinated with aesthetic designs for other portions of the Construction Work; including the walls, drainage, structures, streetscape, lighting and fences; and

h. Inclusion of aesthetic Elements unless these are provided under separate discipline specific plan submittals. Where aesthetic designs are provided elsewhere, provide specific reference to these locations.

i. Landscaped slopes steeper than 3H:1V shall be designed with turf retention blanket for final stabilization.

j. Maintenance access shall be provided to all landscaped areas.

14.6.5. Corridor - Final (100% Level) Landscape Plans

The Developer shall prepare and submit the Corridor - Final (100% level) Landscape Plans for the Corridor to the Department for Acceptance.

14.7. Aesthetic Requirements

14.7.1. Bridges

a. The Developer shall design the finishes and colors for all proposed bridge superstructures and substructures, bridge columns, pier caps, girders, abutments, barrier rails, wing walls, retaining walls, noise walls as provided in the Aesthetic Design Standards for Central 70 included in Schedule 10B Contract Drawings. Existing structures do not need to be modified to comply with these requirements.

b. The Developer's design shall create visually appealing transitions between various Project Elements. (For example, the transition between a noise wall adjacent to a bridge and the noise wall on the bridge shall blend together.)

c. Bridge Elements that shall be included in the aesthetic treatments include the bridge super- and substructures, abutments, columns, bridge rail, barriers, pedestrian fencing, retaining walls, and lighting.

d. Girders on an individual bridge shall have a consistent depth along the bridge to the greatest extent possible.

e. All exposed drain pipes shall be painted to match adjacent bridge Elements. They shall be positioned where least viewed from the roadway.

14.7.2. Retaining Walls and Noise Walls

The Developer shall design and construct walls with aesthetic treatments as provided in the Aesthetic Design Standards for Central 70 included in Schedule 10B Contract Drawings.

14.7.3. Medians

Median treatments shall be in accordance with the Corridor Landscape Exhibit included in the Reference Documents. Where prescribed, hardscape treatments of colored, stamped, or artistic paving shall be provided, including within some "Enhanced Landscape" medians.

14.7.4. Grading and Slope Paving Aesthetics

a. The Developer shall perform all finished grading to maintain an aesthetically pleasing surface, consistent with CDOT best practices; and

b. Existing slopes that are changed, removed, replaced, refreshed, or altered shall be treated as new slopes and reconfigured to be consistent with the requirements described in this Section 14 and the Aesthetic Design Standards for Central 70 included in Schedule 10B Contract Drawings.

14.7.5. Fencing

Fencing shall comply with the CDOT *M & S Standard Plans* or the CDOT B-607-3 Worksheet requirements unless otherwise described in the Aesthetic Design Standards for Central 70 included in Schedule 10B Contract Drawings.

14.7.6. Temporary Wall at Swansea Elementary School

The design and selection of materials for the temporary wall shall be aesthetically pleasing allowing for the installation of public art on the school-facing side of the temporary wall as contemplated in Section 14.3.5 of this Section 14.

14.7.7. Hardscape

Where prescribed, hardscape treatments of colored, stamped, or artistic paving shall be provided, in accordance with the "Hardscape" areas shown in the Corridor Landscape Exhibit included in the Reference Documents. The Developer shall submit details for the hardscape treatments for Acceptance by the Department.

14.8. Landscape Requirements

14.8.1. The Developer's Environmental Compliance Work Plan (ECWP) shall include an organization chart showing Developer's organization of the personnel responsible of implementing the Developer's landscape, irrigation, and noxious weed control programs. The plan shall specifically identify the individuals and positions who shall serve in the key roles, including the Engineer, referenced in the following sections of the CDOT Standard Specifications:

a. Section 212, Seeding, Fertilizer, Soil Conditioner, and Sodding

b. Section 213, Mulching

c. Section 214, Planting

d. Section 215, Transplanting

e. Section 216, Soil Retention Covering

f. Section 217, Herbicide Treatment

g. Section 623, Irrigation Systems

14.8.2. The ECWP shall include a detailed description of the roles that the Developer's Process Control (PC) and Developer's Independent Quality Control (IQC) programs shall be assigned to implement the hold points and decision points required in accordance with the sections of the

CDOT Standard Specifications listed in Section 14.8.1. The Developer's IQC program shall collect all certifications and documentation required for landscape materials. The Developer's IQC program shall inspect and verify that all planted material meets the requirements of this Agreement.

14.8.3. The Developer shall notify the Department a minimum of five Calendar Days in advance of, and invite the Department to attend, all Developer led inspections required to be carried out pursuant to this Section 14.

14.8.4. The landscape plan As-Builts shall be completed by a Registered Landscape Architect in the State of Colorado.

14.8.5. Protection and Preservation

The Developer shall save, protect, and maintain all existing vegetation during implementation of the Construction Work, except for that vegetation that requires removal as part of the Project. All Construction Work shall be performed in such a manner that will avoid these protected areas. The Developer shall protect irrigation systems on land adjacent to the Site. Irrigation systems on adjoining land that are impacted by the work shall be modified so the systems will still function on the adjacent parcel.

14.9. Notice of Substantial Landscape Completion

a. Completion of all landscaping in accordance with the requirements of this Section 14 including that:

i. All plants shall have been planted and all irrigation items shall be operational in compliance with the requirements of this Section 14;

ii. All plants shall be healthy and in flourishing condition and be free of dying branches and branch tips, and shall bear foliage of normal density, size, and color;

iii. All mulch beds shall have been completely mulched to a compacted depth of 3 inches; and

iv. The Notice of Substantial Landscape Completion shall have been issued by the Department;

is a Final Acceptance Condition.

b. Prior to Final Acceptance, the Developer shall submit to the Department for Information a Landscape Maintenance Plan prepared in accordance with the requirements of Section 214 of the CDOT Standard Specifications.

c. When the Developer considers that all the conditions relating to landscape completion have been achieved, it will notify the Department to arrange a joint landscape inspection with the Department, IQC staff, and the Developer's Landscape Architect. This inspection, and any subsequent Department landscape inspections, shall take place when the irrigation systems are operational and during the growing season to allow for the evaluation of the health of the planted material.

d. The Notice of Substantial Landscape Completion, as referenced in Section 214.04 of CDOT Standard Specifications, will be issued by the Department once it is has determined that all conditions to its issuance have been satisfied. The Developer shall provide sufficient documentation, including the As-Builts and documentation from the IQC Program, to allow the Department to evaluate eligibility for the Notice of Substantial Landscape Completion.

e. Issuance of the Notice of Substantial Landscape Completion by the Department will constitute satisfaction of the Final Acceptance Condition specified in Section 1(g) of Part 6 of Schedule 3 Commencement and Completion Mechanics. For certainty, additional landscaping requirements extend beyond Final Acceptance, including Landscape Establishment, Landscape Acceptance, and Landscape Warranty as described in Section 14.10 and Section 14.11.

14.10. Landscape Establishment and Landscape Acceptance

14.10.1. The Landscape Establishment period (as described in Section 214.04 of the CDOT Standard Specifications) will commence following issuance of the Notice of Substantial Landscape Completion by the Department pursuant to Section 14.9.1.d. If the Notice of Substantial Landscape Completion is issued prior to May 31 in any calendar year, the Landscape Establishment period will commence immediately on issuance and last for a period of 12 months. If the Notice of Substantial Landscape Completion is issued on or after May 31 in any calendar year, the Landscape Establishment period will commence on March 1 of the next calendar year and last for a period of 12 months.

14.10.2. The Developer shall comply with the requirements of Section 214.04 of the CDOT Standard Specifications during the Landscape Establishment period. The Landscape Establishment period shall continue until 12 months have passed and the Department has issued a Notice of Landscape Acceptance.

14.10.3. All landscape installations shall be completely maintained by the Developer during the Landscape Establishment period in accordance with the requirements of Schedule 11 Operations and Maintenance Requirements and this Section 14 (including the requirements set out in Appendix B to this Section 14).

14.10.4. The Developer shall audit the landscape installations on at least a monthly basis during the Landscape Establishment period. The results of the audit and a summary of maintenance activities of the proceeding period shall be reported to the Department as part of the Environmental Status Report (ESR) required to be prepared by the Developer pursuant to Schedule 17 Environmental Requirements.

14.10.5. After 12 months of the Landscape Establishment period has elapsed, the Department will inspect the landscaping and irrigation systems to determine compliance to the requirements of the Project Agreement (including as described in Section 1.13 of Part I of Section 32 9300 as set out in Appendix B to this Section 14). The Developer's Landscape Architect shall participate in these inspections. All landscape installations shall be fully established, weed-free, clean, smooth, properly graded, and without plant mortality in order for the Department to issue a Notice of Landscape Acceptance. Should the Department identify any areas of Nonconforming Work, the provisions of Section 6.5 of Schedule 8 Project Administration shall apply, the Developer shall remedy the Nonconforming Work and the Landscape Establishment period (and the Developer's obligations under this Section 14.10.5) shall be extended for a minimum of one additional year at no additional cost. Any dead plant material or any damaged irrigation components shall be replaced or repaired at no additional cost. The Developer shall perform a spring startup on the irrigation system, at no additional cost, ensuring all irrigation components are in working order.

14.10.6. In the event that specific areas of the Site have met the requirements to end the Landscape Establishment period, and other areas have not met those requirements, the Department may, at its discretion, issue a Notice of Landscape Acceptance for those specific areas that have met the requirements. In all other areas the Landscape Establishment period would be extended pursuant to Section 14.10.5.

14.11. Landscape Warranty

14.11.1. All trees, shrubs, and ground covers shall be completely warranted by the Developer for one calendar year from the date of issuance of the Notice of Landscape Acceptance. Any plant material deemed deficient following this one-year warranty period shall be replaced in-kind by the Developer at no additional cost, and shall be warranted for one additional year by the Developer. Any additional one-year warranty period beyond the initial one-year warranty period will be considered an extended warranty period. Another inspection will be conducted at the request of the Developer at the end of the extended warranty period to determine eligibility to end the extended warranty period.

14.11.2. The Developer shall protect Accepted Landscape elements during the Warranty Period. In the event that Developer activities damage Accepted Landscape elements, the Developer shall

restore those damaged elements. The Department may, at its discretion, extend the Warranty Period on those elements.

14.12. Deliverables

The Developer shall submit the following to the Department for Information, Acceptance, or Approval in accordance with the timeframes specified:

Table 14-1 Deliverables

Deliverable	Information, Acceptance, or Approval	Schedule
Cover and Swansea Elementary School outdoor areas – Preliminary Landscape and Aesthetic Plans	Acceptance	Prior to the issuance of NTP2
Cover and Swansea Elementary School outdoor areas – Final Landscape and Aesthetic Plans	Acceptance	Prior to RFC Documents
Corridor – Existing Site Inventory	Acceptance	Prior to the issuance of NTP 2
Corridor – Preliminary Landscape Plans	Acceptance	Prior to Final Landscape Plan Submittal
Corridor – Final Landscape Plans	Acceptance	Prior to RFC Documents
Landscape Maintenance Plan	Information	Prior to Final Acceptance
Certificate of Compliance for Imported Topsoil	Information	Prior to hauling topsoil to the Project
Landscape and Aesthetic As-Built plans	Acceptance	Prior to Final Acceptance

14.13. Appendices

Appendix A Project Special Provisions

Appendix B Cover Specifications

Appendix A
Project Special Provisions

The following specifications modify and take precedence over the Standard Specifications. The requirements of Appendix A to Schedule 10A Applicable Standards and Specifications apply to these Project Special Provisions.

PROJECT SPECIAL PROVISIONS

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Index	14-23
Section 519 – Garden Roof Assembly	14-23 to 14-45
Section 520 – Engineered Resin Panels	14-46

SECTION 519
GARDEN ROOF ASSEMBLY

Section 519 is hereby added to the Standard Specifications for the project as follows:

DESCRIPTION

519.01 This work consists of furnishing and installing Garden Roof Assemblies as a complete system including; monolithic waterproofing membrane, reinforcing, flashing, protection course / root barrier protection – at landscape areas, protection course – at vehicular and pedestrian traffic areas, insulation: EPS geofoam, drainage / water retention components, filter fabrics, soils, garden roof accessory components, and erosion control materials.

MATERIALS

519.02 The Developer is responsible for providing the materials required for the Construction Work following industry best practices and the manufacturer recommendations to meet a total Garden Roof Assembly system warranty per Section 519.20. Material requirements are as follows:

(a) *Monolithic Waterproofing Membrane.* Waterproofing Membrane shall be a hot, fluid applied, rubberized asphalt meeting the Construction Standards and other pertinent physical properties listed in Table 519-01.

Table 519-01

PROPERTY	TEST METHOD	TYPICAL RESULT
Flash point	ASTM D-92	<500°F*
Penetration	ASTM D-5329	3.9 in @77°F (25°C)
Flow	ASTM D-5329	0.04 in @ 140°F (60°C)
Toughness	CGSB-37.50-M89	16.0 Joules
Ratio of Toughness to Peak Load	CGSB-37.50-M89	0.069
Water Vapor Permeability	ASTM E-96, PROCEDURE E CGSB-37.50-M89	0.3 ng/Pa(s)M^2
Water Absorption	CGSB-37.50-M89	.11 gram weight gain
Low Temperature Flexibility (-25°C)	CGSB-37.50-M89	No delamination, adhesion loss, or cracking or cracking
Low Temperature Crack Bridging Capability	CGSB-37.50-M89	No cracking, adhesion loss, or splitting
Heat Stability	CGSB-37.50-M89	No change in viscosity, penetra-tion, flow or low temperature flexibility
Viscosity	CGSB-37.50-M89	11.0 seconds
Water Resistance (5 days/50°C)	CGSB-37.50-M89	No delamination, blistering, emulsification, or deterioration
Softening Point	ASTM D-36	180°F (82°C)
Elongation	ASTM D-5329	1000% minimum
Resiliency	ASTM D-3407	40% minimum
Bond to Concrete	ASTM D-3407	Pass 0°F (-18°C)
Acid Resistance	ASTM D-896 Procedure 7.1 (N-8)	Pass-50% Nitric Acid -50% Sulfuric Acid

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SECTION 519
GARDEN ROOF ASSEMBLY

Table 519-01 continued

PROPERTY	TEST METHOD	TYPICAL RESULT
Resistance to Hydrostatic Pressure	ASTM D-08.22 Draft 2	100 psi (equals 231 foot of head water)
Resistance to Salt Water	ASTM D-896 similar 20% sodium chloride sodium carbonate calcium chloride	No delamination, blistering, emulsification or deterioration
Resistance to Fertilizer	ASTM D-896 similar undiluted, 15/5/5, nitrogen/phosphorus/potash	No delamination, blistering, emulsification or deterioration
Resistance to Animal Waste	3-year exposure	No deterioration
Solids Content		100%-no solvents
Shelf Life		10 years (sealed)
Specific Gravity		1.23 + .02
*102°F more than the application temperature recommended by the manufacturer.		

(b) *Reinforcing.*

1. Standard Duty Reinforcing: Spunbonded polyester fabric membrane reinforcing sheet in standard widths of 6, 12, and 39 inches and a length of 600 feet, meeting the requirements listed in Table 519-02.

Table 519-02

PROPERTY	TEST METHOD	TYPICAL RESULT
Color	NA	White
Unit Weight (oz/sq yd)	ASTM D1910	1.35
% Elongation (to break)	ASTM D2523	42
Tear Strength (lb)	ASTM D2263	8
Breaking Strength (lb)	ASTM 2523	25
De Matia Flex Cycles	ASTM D813	100,000

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SECTION 519
GARDEN ROOF ASSEMBLY

2. Heavy Duty Reinforcing: 60-mil (1.5 mm) thick, in standard widths of 6, 12, 18, 24, 36 and 48 inches, and a length of 100 feet, uncured neoprene membrane reinforcing sheet meeting the requirements listed in Table 519-03.

Table 519-03

PROPERTY	TEST METHOD	TYPICAL RESULT
Width (inch)	ASTM D751-66	0 /+ 0.125
Length (inches)	ASTM D751-66	0 /+ 1.0
Thickness (inches)	ASTM D751-66	0.060 +/- 10%
Tensile Strength (psi, min)	ASTM D412, Die C	1400
Elongation (%, min)	ASTM D412, Die C	300
Tear resistance (lb/inch, min)	ASTM D624, Die C	125
Brittleness Point @ -30° F	ASTM D2137	No Break
Ozone Resistance (@20% Ext., 100 MPa, 100 hrs @ 104° F	ASTM 1149	No Cracks @ 7x Magnif.
Water Absorption (%, weight change range) (46 hrs. @ 158° F)	ASTM D471	-8, +2

(c) *Flashing.*

1. 60-mil (1.5 mm) thick, uncured neoprene sheet meeting the requirements of Heavy Duty Reinforcing

2. Two-component, liquid applied resin membrane flashing system.

   A. Poly methyl-methacrylate (PMMA) resin per manufacturer's recommendations.

   B. Acrylic resin with integral chopped polymer fiber reinforcement per manufacturer's recommendations.

   C. Resin based primers, additives, reinforcing fleece, surfacing topcoats per manufacturer's recommendations.

(d) *Protection Course / Root Barrier Protection – at Landscape Areas.* 160-mil (4 mm) thick polyester reinforced, rubberized asphalt sheet with granular surface and root inhibiting additive. Roll size shall be approximately 39 inches wide by 33 feet long, and have a minimum tensile strength of 50 lbs/inch (machine & cross direction @ 163°F (73°C).

(e) *Protection Course – at Vehicular and Pedestrian Traffic Areas.* 85-mil (2 mm) thick heavy duty, rubberized asphalt protection sheet with synthetic fiber reinforcement. Roll size shall be approximately 39 inches wide by 50 feet long.

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SECTION 519
GARDEN ROOF ASSEMBLY

(f) *Insulation.* Expanded Polystyrene (EPS) Geofoam

1. Foam-Control EPS Geofoam Type EPS29 in compliance with the properties listed in Table 519-04.

Table 519-04

FOAM-CONTROL EPS GEOFOAM PROPERTIES								
PROPERTY	**UNITS**	**ASTM D6817**						
		EPS12	**EPS15**	**EPS19**	**EPS22**	**EPS29**	**EPS39**	**EPS46**
Density[1], min.	lb/ft^3	0.70	0.90	1.15	1.35	1.80	2.40	2.85
Compressive Resistance[1,2] @ 1% deformation, min.	psi	2.2	3.6	5.8	7.3	10.9	15.0	18.6
Elastic Modulus[1], min	psi	220	360	580	730	1090	1500	1860
Flexural Strength[1], min.	psi	10.0	25.0	30.0	35.0	50.0	60.0	75.0
Water Absorption[1] by total immersion, max.	vol. %	4.0	4.0	3.0	3.0	2.0	2.0	2.0
Oxygen Index[1], min.	vol. %	24	24	24	24	24	24	24
Buoyancy Force	lb/ft^3	61.7	61.5	61.3	61.1	60.6	60.0	59.5
Additional Properties for Compressible Applications								
Compressive Resistance[1] @ 5% deformation, min.	psi	5.1	8.0	13.1	16.7	24.7	35.0	43.5
Compressive Resistance1 @ 10% deformation, min.	psi	5.8	10.2	16.0	19.6	29.0	40.0	50.0
See ASTM D6817 Standard for test methods and complete information Combined live and dead load stresses should not exceed the compressive resistance at 1% deformation.								

2. All Foam-Control EPS Geofoam blocks shall be treated by the manufacturer with a tested and proven termite treatment for below grade applications, 3 year minimum field exposure. The treatment shall be EPA registered, meet requirements of ICC ES EG239, and be recognized in an ICC ES report.

3. Geogripper Plates – The plates shall be made of 20 gauge galvanized or stainless steel, 4”x4” with two-sided 0.6” high multi-barbed design capable of piercing the EPS Geofoam. Each plate shall be capable of a lateral holding strength of 60 lbs.

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SECTION 519
GARDEN ROOF ASSEMBLY

(g) *Drainage/Water Retention Components.*

1. Hydrodrain Air Layer: Composite drainage system consisting of a three dimensional, crush-proof, drainage core and filter fabric meeting the requirements listed in Table 519-05 for Geonet Style 300.

Table 519-05

PROPERTY	TEST METHOD	UNITS	Geonet Style			Dimple Style			
			300	302	1000	400	420	700	900
Thickness	ASTM D1777	Inch	0.25	0.25	0.25	0.40	0.40	0.40	0.40
Compressive Strength	ASTM D1621	psf	40,000	40,000	40,000	15,000	15,000	21,000	30,000
Core Flow @ 3600 psf; hydraulic gradient = 1 (per unit width)	ASTM D4716	Gal/min/ft	8.5	8.5	8.5	21	21	23	24
Fabric Flow	ASTM D4491	Gal/min/ ft^2	140	140	140	140	140	18	18
Fabric Grab Tensile Strength	ASTM D4632	Lb	100	100	100	100	100	MD 370 (1.65)	MD 370 (1.65)
Fabric AOS	ASTM 4751	U.S. Sieve	70	70	70	70	70	70	70
Fabric Puncture Strength	ASTM D4833	Lb	65	65	65	65	65	120	120
Fabric UV Resistance @ 500 hours	ASTM D4355	%Strength Retained	70	70	70	70	70	90	90
Roll Dimensions	NA	Ft	4x75	4x75	4x50	4x50	4x50	4x50	4x50
Roll Weight	NA	Lb	70	80	55	39	42	47	52

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SECTION 519
GARDEN ROOF ASSEMBLY

(h) *Gardendrain Moisture Panels.* Three-dimensional, molded panels of recycled polyethylene with drainage channels top and bottom sides and water retention reservoirs top side meeting the requirements listed in Table 519-06.

Table 519-06

PROPERTY	TEST METHOD	TYPICAL RESULT
Panel Dimensions	NA	4 ft. x 6 ft.
Panel Height	NA	2 inches
Weight w/cups empty w/cups filled	NA	 0.4 lb/ft^2 dry; 2.0 lb/ft^2 wet 4.3 lb/ft^2 dry; 6.3 lb/ft^2 wet
Strength w/cups empty w/cups filled	ASTM D1621	 3,154 lb/ft^2 > 7,000 lb/ft^2
Flow Rate	ASTM D4716	42 gal./min./ft width; h.g. = 1
Water Retention w/cups empty w/cups filled	NA	 0.19 gal/ft^2 0.20 gal/ft^2
Volume to Fill	NA	0.08 ft^3/sf in area

(i) *Filter Fabrics.*

Non-woven, polymeric, geotextile fabric meeting the requirements listed in Table 519-07.

Table 519-07

PROPERTY	TEST METHOD	TYPICAL RESULT
Roll Size	NA	12.5 ft x 120 ft
Weight	ASTM D5261	3.5 oz/yd^2
Flow Rate	ASTM D4491	150 gal/min/ft^2
Tensile Strength	ASTM D4632	90 lb
Elongation	ASTM D4632	50%
Mullen Burst	ASTM D3786	185 lb/in^2
Puncture Strength	ASTM D4833	60 lb
Trapezoidal Tear	ASTM D4533	40 lb
Apparent Opening	ASTM D4751	50

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(j) *Soil.*

1. Custom Growing Media Mix capable of supporting vigorous growth of the specified vegetation. The soils scientist is fully responsible for the determination of the final material specification, specific to the final landscaping and soil volume design, in coordination with the City of Denver Forester. Custom Growing Media Mix shall be coordinated with the structural design of the Cover and not to exceed the saturated density weights complying with the specifications listed in Table 519-08.

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Table 519-08

PROPERTY	TEST METHOD	TYPICAL RESULT*
Grain Size Distribution (ASTM F1632 Method B)		
Clay fraction		<6%
Silt Fraction		<12%
Passing #200 Sieve		5 – 20%
Passing #60 Sieve		15 – 40%
Passing #18 Sieve		40 – 70%
Passing #10 sieve		70 – 95%
Passing 1/8 –inch sieve		95 – 100%
Passing 1/4-inch sieve		98 – 100%
Passing 3/8-inch sieve		100%
Density (ASTM E2399)		
Application Density		44 – 68 lbs/ft^3
Saturated Density		76 – 100 lbs/ft^3
Water/Air Management (% Vol.) (ASTM E2399)		
Saturated water capacity		> 40%
Saturated air content		> 10%
Total Pore space		>50%
Water Permeability		
Saturated Hydraulic Conductivity		6-10 in/hr
pH, Lime, and Salt Content		
pH (saturated paste)		6.0 – 8.0
salts content (water extract)		< 3.0 mmhos/cm
Organics (LOI 550C)(ASTM F1647)		
Organic Matter content		3 – 6 mass %
Nutrients **		
Nitrogen (NO3)		3 – 15
Phosphorus		1 – 7
Potassium		6 – 15
Calcium		19 – 65
Magnesium		3 - 15
CEC Capacity		> 6 cmol/kg
Compost Fraction 1. Meet or exceed USEPA Class A standard, 40 CFR 503.13, Tables 1 & 3 (chemical contaminants) and 40 CFR 503.32(a) (pathogens) and/or be permitted in the state of origin to produce Class A material. 2. Meet US Compost Council STA/TMECC criteria or equal for Class I or II stable, mature product. 3. Testing of material shall be by an approved laboratory with recommendations to support intended plants specified. Required testing of each batch or by each major area of the cover.		

* Values may be adjusted due to availability of local materials or special project conditions related to plant selection and/or environmental conditions, pending approval of the soils scientist.
** Nutrients shall be adjusted with appropriate slow-release fertilizer with micronutrient additions if below lower target range.

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2. Expanded Lightweight Aggregate for use as fill material at vegetation-free zones shall meet the specifications listed in Table 519-09.

Table 519-09

PROPERTY	TEST METHOD	TYPICAL RESULT
Grain Size Distribution	NA	
Clay fraction		< 1%
% passing #18 Sieve		1 – 3%
%passing 1/4-inch Sieve		10 - 30%
% passing 3/8-inch Sieve		90 – 100%
Density	NA	
Saturated Density		< 60 lb/ft^3
Dry Density		< 50 lb/ft^3
Saturated Hydraulic Conductivity	NA	> 15 inch/minute
pH, Lime, and Salt Content	NA	
pH (in $CaCl_2$)		6.0 – 8.5
carbonate content		< 25 g/l
salts content (water extract)		< 2.5 g/l
Organics		
OM content	NA	< 1% mass
Abrasion Resistance	ASTM C131-96	< 25% loss
Soundness	ASTM C88	< 0.50% loss

(k) *Garden Roof Accessory Components.*

1. Drain Inspection Chambers - 18 gauge stainless steel, over-drain inspection boxes, with perforated sides and removable lids. Utilize extensions to increase the height for deeper growing media applications. Inspection Chambers shall be located within shrub/groundcover areas so they can be screened visually and shall be set square to adjacent paving or hard edges.

2. Vegetation Transition Areas – Metal Angle of unfinished aluminum bent at a 90 degree angle, with a slotted vertical leg to allow for drainage.

(l) *Erosion Control Materials.*

1. Erosion Control Mat. Biodegradable Erosion Control Matting: Composed of straw and/or coconut fiber stitched together with biodegradable thread forming top and bottom netting, meeting the requirements listed in Table 519-10.

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Table 519-10

PROPERTY	TEST METHOD	TYPICAL RESULT
Width (feet)	NA	6.67 +/- 5%
Length (feet)	NA	108.0 +/- 5%
Thickness (inches)	ASTM D5199 / ECTC[1]	0.26
Weight (oz/yd^2)	ASTM D5261	8.83
Tensile Strength (MD[2] – lb/ft)	ASTM D5035	342
Tensile Strength (TD[3] – lb/ft)	ASTM 5035	211
Elongation (MD - %)	ASTM D5035	7.6
Elongation (TD - %)	ASTM D5035	11.1
Water Absorption (%)	ASTM D1117 / ECTC	0.11
Resiliency (%)	ECTC	85
Stiffness / Flexibility (oz-in)	ASTM D1388 / ECTC	0.11
Smolder Resistance	ECTC	YES[4]

1. ECTC = Erosion Control Technology Council
2. MD = Machine Direction
3. TD = Transverse Direction
4. Material is smolder resistant according to ECTC Guidelines

2. Heavy-Duty Anchors. Plastic Anchor Disk with connected plastic stem and friction-fit plastic top disk used to fasten Biodegradable Erosion Control Matting or sedum carpet and tile. The plastic anchor shall have the following thicknesses: Base Disk: 3/16 inch; Shaft: 3/8 inch diameter; Top Disk: 0.03 inch. The plastic anchor length and width shall be as follows: Base Disk: 5 inch diameter; Shaft: 12 inch; Top Disk: 4.75” diameter.

3. Hydromulch. Wood fiber-based hydromulch with natural-based tackifier for use in securing sedum cuttings on the application area. Hydromulch shall be mixed with tackifier and applied as wet slurry to cutting installations.

4. Dry Hydromulch. Wood fiber or straw-based hydromulch with integrally mixed guar-based tackifier. For use where hydromulching equipment and access is not possible. Dry hydromulch shall be applied in accordance with these specifications and per manufacturer’s recommendations.

519.03 Soils Scientist. The contractor shall provide a Soils Scientist to evaluate and determine the custom growing media properties, design of media layering by textures (crushed rock drainage layers / perched water tables / proper drainage to be achieved) and to ensure long term vegetation growth will be successful.

Schedule at least 3 months for soil ingredient search and initial submittal Approval. Submit representative materials samples of the same organic batches and soil mixes that will be used for the Soil Scientist and Department’s initial Approval. Do not order materials until the Department’s initial Approval has been obtained.

Provide mock-up of planting soil profiles of initially Approved soils and make final adjustments to soils properties as a result of planting mock-up results. Submit a custom growing media mix with representative materials samples to the Department for final Acceptance. Delivered materials shall closely match the final Approved samples.

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CONSTRUCTION REQUIREMENTS

519.04 Submittals. The contractor shall submit testing results to ensure materials meet the following qualifications:

(a) Certification from an approved independent testing laboratory experienced in testing this type material, that the material meets these specifications for rubberized asphalt waterproofing membranes (testing not greater than 5 years old) 25% post-consumer recycled rubber content and inert clay fillers. Testing shall be done by a national testing laboratory acceptable to the engineer.

(b) Certification and description of the full time quality control/quality assurance program of production facilities responsible for the manufacture of the rubberized asphalt and that each batch of material is tested to insure conformance with the manufacturer's published physical properties.

The quality assurance program description shall include all methods of testing for physical and mechanical property values. Provide confirmation of manufacturer's certificate of analysis for reporting the tested values of the actual material being supplied for the project prior to issuance of the specified warrantee.

(c) Certification showing that all components of the Green Roof Assembly are being supplied and warranted.

(d) Documentation that the roof waterproofing membrane assembly is currently Class A listed with Underwriters Laboratories.

(e) Documentation from an approved, independent testing laboratory that the extruded polystyrene insulation if used is free from CFC's.

(f) The plant manufacturing the rubberized asphalt material shall have IS0 9001-2000 approval as evidenced by a notarized copy of the official certificate.

(g) Provide product data on all components of the Garden Roof Assembly.

(h) Documentation that the waterproofing membrane assembly is currently listed as a Class 1 Roof Cover with Factory Mutual Research Company Standard 4470 listing for the proposed membrane system. The waterproofing membrane configuration shall be approved by FM for Class 1-SH (severe hail) exposure.

(i) Documentation from an approved, independent testing laboratory that the roofing waterproofing membrane is resistant to salt water when tested in accordance with ASTM D-896.

(j) Documentation from an approved, independent testing laboratory that the roofing waterproofing membrane is resistant to fertilizer when tested in accordance with ASTM D-896.

(k) Documentation that the roofing waterproofing membrane is resistant to a three year exposure to animal waste.

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(l) Documentation from an approved, independent testing laboratory that the roofing waterproofing membrane can withstand a minimum 100 psi resistance to hydrostatic head in accordance with ASTM D-08.22.

(m) Documentation from an approved, independent testing laboratory that the Garden Roof Assembly root barrier has the ability to resist normal root or rhizome penetration as required by ANSI/SPRI VR_1 2011 "Procedure for Investigating Resistance to Root Penetration on Vegetative Roofs". The documentation shall consist of the testing laboratories report summarizing the successful testing of all seams, edges, and methods of attachment that are exposed to roots or rhizomes for a period of at least 24 months.

(n) Stormwater performance of the Garden Roof Assembly utilized for this project shall be provided and include:

1. Composite Curve Number (CN)
2. Composite C factor
3. Total volume of water stored in the growing media
4. Total volume of water stored in the water retention / drainage element
5. Hydrograph of vegetated roof system showing storm water release delay and stormwater volume reduction.

(o) List of 3 of the proposed primary waterproofing membrane manufacturer's projects, located in the State of Colorado, of similar scope and complexity which have been performing successfully for a period of at least 20 years. Provide current phone contacts of Architects and Owners for verification.

519.05 Quality Assurance.

(a) *Waterproofing Contractor Qualifications*. All Waterproofing work shall be performed by a company specializing in performing the work of this section with at least 10 continuous years documented experience and certified by the waterproofing membrane manufacturer.

1. Certification. Certification or licensing shall have been in effect continuously for at least ten (10) years prior to bidding on this Project.

2. Contractor shall have at least ten years of experience in installing materials specified and shall have successfully completed at least three projects of similar scope and complexity in the state of Colorado. Provide current phone contacts of Architects and Owners for verification.

   A. Contractor Certification. Obtain written certification from manufacturer of rubberized asphalt waterproofing system certifying that Contractor is approved by manufacturer for installation of specified waterproofing membrane system. Provide copy of certification to Owner prior to commencement of waterproofing work.

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B. Contractor's Field Supervision. Installer must maintain full-time supervisor/foreman on jobsite during times that waterproofing work is in progress.

C. Manufacturer's Field Supervision. The manufacturer shall maintain supervision of the work and have a full time representative witnessing the work in progress on a weekly basis (different time of day each week so that all parts of the work can be inspected), with a minimum of 8 hours per week.

3. Contractor shall designate a single individual as project foreman who shall be on site at all times during installation. Foreman shall be employed by the Contractor for at least five (5) years and have at least ten (10) years of experience installing the specified product. Contractor shall designate key personnel of the on-site crew who shall be experienced in work of the type specified. Neither the foreman nor the key personnel shall be changed without the Owner's consent.

4. Waterproofing Contractors shall be approved by the manufacturer meeting these qualifications:

(b) *The Garden Roof Assembly Installing Contractor*. The contractor performing all work other than Waterproofing shall demonstrate qualifications to perform the work of the section by submitting the following documentation:

1. Certification or license by the Garden Roof Assembly supplier as a locally based, authorized applicator of the products intended for use, that the contractor has a minimum of five (5) years of experience on similar projects.

2. List of at least three (3) projects, satisfactory completed within the past five (5) years, of similar scope and complexity to this project. Previous experience submittal shall correspond to specific waterproofing membrane system specified on the plans and in these specifications.

3. Supplier pre-approved Garden Roof Assembly Contractors shall be used meeting these qualifications:

(c) The Developer's Garden Roof Assembly Maintenance Contractor shall demonstrate qualifications to perform the work of this Section by submitting the following documentation:

List of at least three (3) Garden Roof Assembly projects, satisfactorily completed within the past five (5) years, of similar scope and complexity to this project. Previous experience submittal shall correspond to specific waterproofing membrane systems specified on the plans and in these specifications.

(d) *Waterproofing Membrane Manufacturer Qualifications*. Manufacturer shall demonstrate qualifications to supply materials of this section by certifying the following:

1. Waterproofing Membrane Manufacturer shall provide documentation that the specified rubberized asphalt has been manufactured by the same source for at least twenty (20) years and successfully installed on a yearly basis for a minimum of twenty (20) years on projects of similar scope and complexity.

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2. The specified waterproofing membrane shall be designed for the life of the structure. Independent verification with life of structure designation shall be provided.

3. Waterproofing Membrane Manufacturer shall not issue warranties for terms longer than they have been manufacturing their hot fluid rubberized asphalt waterproofing membrane.

(e) The rubberized asphalt waterproofing membrane product shall contain an inert clay filler and crumb rubber to enable the product to be resistant to acids (fertilizers, building washes and acid rain) and maintain membrane thickness during application. Waterproofing Membrane Manufacturer shall show independent testing of acid resistance performance testing.

(f) Waterproofing Membrane Manufacturer shall have available an in-house technical staff to assist the contractor, when necessary, in application of the products and final inspection of the assembly.

(g) *Pre-Construction Conferences*. The manufacturer shall meet with the necessary parties at the jobsite to review and discuss project conditions as it relates to the integrity of the roofing assembly.

(h) The rubberized asphalt waterproofing membrane product shall be an environmental-grade product with a minimum 25% post-consumer recycled content. Manufacturer shall provide independent certification of recycled content.

(i) *Landscape Installer Qualification*. Qualified installer trained by the Garden Roof Assembly system provider who is authorized, approved, or licensed to install the specified products.

(j) Garden Roof Assembly Supplier shall show evidence that the specified Garden Roof Assembly has been developed, marketed, supported and installed for a minimum of twenty (20) years on projects of similar scope and complexity.

(k) Garden Roof Assembly Supplier shall provide data and calculations, specific to the products being submitted, that verify that the Garden Roof Assembly specified meets the project criteria for storm water runoff volume and rate control.

1. Calculations shall be based on actual testing for supplier's Garden Roof Assembly components to be used for the project including but not limited to the regionally specific growing media formulation and water retention/drainage materials.

2. Calculations shall account for vegetated and un-vegetated portions of the roof as well as local climatic conditions including rainfall depth, intensity, duration, and timing.

(l) Garden Roof Assembly supplier shall provide data demonstrating that the composite C-factor and Curve Number parameters for the specified Garden Roof Assembly are less than or equal to those factors used in the engineering design and analysis for the projects drainage and storm water systems analysis.

(m) *Custom Growing Media Mix Contractor Qualifications.* Contractor shall have at least five years of experience making and providing athletic, horticultural, or golf course soils. Additionally, contractor shall provide and submit to the Department for Acceptance, company profile and name with references from a minimum of 5 projects where they have successfully completed custom growing media mix planting soils. The contractor shall be engaged at least three months prior to

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scheduled soil installation to allow for sufficient time for material searches and initial soil planting mix Approval.

(n) *Growing Media Confinement System*.

1. Submit current product quality assurance test data and independent laboratory test results indicating compliance with specified performance.

2. Growing media and growing media confinement system shall be supplied by same manufacturer.

3. Garden Roof Assembly Manufacturer will provide load calculations for growing media confinement system. All structural load calculations for the growing media confinement system shall be verified by the Project's structural engineer or architect.

4. The attachment or anchoring of the growing media confinement system to the structure shall be designed and verified by the Project's structural engineer as adequate for the application.

519.06 Delivery, Storage, and Handling.

(a) Deliver materials in original unopened containers of packaging clearly labeled with manufacturer's name, brand name, and instructions for use, all identifying numbers, and U.L. labels.

(b) Materials shall be stored in a neat, safe manner, not to exceed the allowable structural capacity of the storage area.

(c) Store materials in a clean, dry area protected from water and direct sunlight.

(d) Store all adhesives at temperatures between 60°F (15.5°C) and 80°F (26.6°C). If exposed to lower temperatures, restore materials to 60°F (15.5°C) minimum temperature before using.

(e) Vegetation shall be handled and stored in accordance with the Garden Roof Assembly Manufacturer's recommendations and guidelines.

519.07 Project Conditions.

(a) Application of the waterproofing membrane shall not commence nor proceed during inclement weather. All surfaces to receive the membrane shall be free of water, dew, frost, snow and ice.

(b) Application of waterproofing membrane shall not commence nor proceed when the ambient temperature is below 0°F (17.7°C).

(c) Preparation and application of waterproofing membrane shall be conducted in well ventilated areas.

(d) Over its service life, do not expose waterproofing membrane or accessories to a constant temperature in excess of 180°F (82°C) (i.e., hot pipes and vents or direct steam venting, etc.).

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(e) Adhesives contain petroleum distillates and are extremely flammable. Do not breathe vapors or use near an open fire. Do not use in confined areas without adequate ventilation. Consult container or packaging labels and Material Safety Data Sheets (MSDS) for specific safety information.

(f) Do not allow waste products (petroleum, grease, oil, solvents, vegetable or mineral oil, animal fat, etc.) to come in contact with the roof waterproofing membrane. Any exposure to foreign materials or chemical discharges shall be presented to waterproofing membrane manufacturer for evaluation to determine any impact on the deck waterproofing membrane assembly performance.

(g) Condition of concrete deck for application of waterproofing membrane. The entire deck and the sides of the curbs for a height of 2 inches above the plan thickness of Garden Roof Assemblies shall be free of all foreign material such as dirt, grease, old pavement and primer. All decks shall be sand blasted or shot blasted. Immediately prior to the application of primer or any type of waterproofing membrane, all dust and loose material shall be removed. The deck condition will be approved by waterproofing membrane manufacturer before application of membrane.

(h) Contractor shall assure that adequate protection is provided after installation so other trades do not damage waterproofing membrane.

519.08 Inspection.

(a) The Waterproofing Contractor shall examine all surfaces to receive the waterproofing membrane to verify it is acceptable and proper for the application of the membrane.

(b) The Waterproofing Contractor shall not proceed with the installation of the waterproofing membrane assembly until all defects have been corrected.

519.09 Preparation.

All surfaces shall be dry, smooth, free of depressions, voids, protrusions, clean and free of unapproved curing compounds, form release agents and other surface contaminants.

(a) Cast in-place concrete/Composite deck: All concrete operations shall be performed in accordance with contract documents.

(b) *Substrate cleaning.*

1. Thoroughly sweep the substrate which is to receive the roof waterproofing membrane.

2. Substrate shall also be blown clean using an air compressor to remove any remaining loose debris.

3. If requested by the manufacturer, perform final check to determine if concrete has been properly cleaned by applying a test patch of membrane to the surface and check its adhesion.

519.10 Installation.

(a) *Surface conditioner application (to concrete).*

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1. Apply a surface conditioner as recommended by the manufacturer and in conformance with ASTM D41 only to concrete using a hand held sprayer evenly at a rate of 300 to 600 SF/gallon (7.4 - 14.7 m2/L) depending on surface texture. Surface conditioner shall "tan" the surface, not blacken it.

2. Allow sufficient time for the surface conditioner to thoroughly dry prior to the waterproofing membrane application.

(b) *Waterproofing membrane preparation.*

1. The waterproofing membrane shall be heated in double jacketed, oil bath or hot air melter with mechanical agitation, specifically designed for the preparation of a rubberized asphalt membrane.

2. Heat membrane until membrane can be drawn-free flowing at a temperature range between 350°F (176°C) and 375°F (190°C).

(c) *Detailing/Flashing.*

1. All detailing and flashing shall be done in accordance with the manufacturer's standard guideline details.

2. All detailing and flashing shall be completed before installing the waterproofing membrane over the field of the substrate.

3. Install waterproofing membrane and fabric reinforcing at all joints per plan details prior to full waterproofing membrane application.

(d) *Waterproofing Membrane Application.*

1. Apply the rubberized asphalt waterproofing membrane at a rate to provide a continuous, monolithic coat of 90 mil minimum (approximately 2.3 mm), into which is fully embedded a layer of the spunbonded polyester fabric reinforcing sheet, followed by another continuous monolithic coat of waterproofing membrane at an average thickness of 125 mil (approx. 3.2 mm). Total waterproofing membrane thickness is to be 215 mils average (approx. 5.5 mm), 180 mils minimum.

2. Overlap fabric reinforcing sheet 1-2 inches (25.4 mm - 50.8 mm) with waterproofing membrane between sheets.

519.11 Separation/Protection Course Installation.

(a) Separation/Protection course shall be installed as follows:

1. Embed the *Protection Course / Root Barrier Protection – at Landscape Areas* into the membrane while it is still hot to insure a good bond. Overlap adjoining sheet edges 4 inches (100 mm) and seal the laps with a propane torch.

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2. Embed the *Protection Course – at Vehicular Traffic Areas* into the membrane while it is still hot to insure a good bond. Installation of a separation course is necessary in order to carry out the water test. Overlap adjoining sheet edges (dry) a minimum of 2 inch – 3 inch (50.8 mm - 76.2 mm) to insure complete coverage.

519.12 Waterproofing Membrane Integrity Test.

(a) The roof area or portions thereof shall be leak tested by means of electronic testing to check the integrity of the waterproofing membrane installation. If leaks are observed the waterproofing membrane installation shall be repaired.

(b) In the event of excessive damage to the waterproofing membrane assembly, electronic breach detection testing shall be required prior to the placement of subsequent overburden.

519.13 Drainage, Insulation, and Components Installation.

(a) All Drainage, Geofoam and Components shall be installed outside of Vehicular Traffic Areas per manufacturer's requirements.

(b) *Insulation*. Where specified, EPS Geofoam insulation shall be installed loose-laid in accordance with manufacturer's recommendations. Connector plates shall be used to restrain EPS Geofoam from moving laterally. A minimum of two plates for each 4'x8' section of EPS block shall be installed to minimize EPS Geofoam block to block movement during installation. Additional plates shall be utilized where multiple layers of EPS Geofoam are utilized as per manufacturer's recommendations.

(c) *Hydrodrain Air Layer*. Install over the insulation with the filter fabric facing up and the 4 inch overlap of fabric up against the perimeter edge. This fabric overlap should be folded under the core along the perimeter edge. Overlap the 4 inch (100 mm) salvage edge of the geotextile fabric to adjoin sheets and hold in place with duct tape.

(d) *Gardendrain Moisture Panels*. Install with holes through the dimples on top, over the Hydrodrain Air Layer. Adjacent panels shall be butt together or overlapped approximately 1 inch (25 mm). Cut to fit around penetrations, etc. with a heavy-duty utility knife or small toothed saw. Fill retention cups with Expanded Lightweight Aggregate.

(e) *Moisture Retention Mat*. A layer of Moisture Mat shall be installed over the root barrier (when no insulation is specified) or air layer/ insulation, lapping adjacent rolls a minimum of 4 inches (100 mm). The Moisture Mat shall be turned up all vertical, roofed/flashed surfaces a minimum of 6 inches (150 mm) beyond the anticipated soil level. Any excess shall be trimmed down to the level of the soil.

(f) *Filter Fabric*. Install over Gardendrain Moisture Panels, lapping adjacent rolls a minimum of 6 inches (150 mm). Enough material shall be left to be drawn up above the anticipated soil level. Any excess shall be trimmed down to the level of soil.

For slopes ⩾2:12 and <3:12 (approx. 10 - 15°, 17 - 25%) filter fabric shall not be installed over the Gardendrain (only) throughout the field of the roof so that the growing media shall be placed directly into the cups. Filter fabric shall be laid at penetrations, terminations, etc.

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(g) *Drainage/Soil Confinement System*. Place on sloped surfaces in accordance with manufacturer's recommendations.

519.14 Hard Scape / Accessory / Ballast Installation.

(a) All drains shall be fitted with inspection/maintenance boxes and grills, built up to ensure access at soil level.

(b) Stone and / or landscape pavement shall be installed at all penetrations, and access hatches and as required for vegetation free zones and as walkway / maintenance paths.

519.15 Custom Growing Media Quality Assurance, Handling and Storage and Installation.

(a) *Quality Assurance.*

1. Samples: Planting soils requires a long lead time. Prior to ordering the listed materials, submit representative samples of the same organic batches and soil mixes that will be used to the Soil Scientist for selection and approval. Do not order materials until the Scientist's approval has been obtained.

   A. Organic amendment: duplicate samples of 2 quarts.

   B. Soil Mix: duplicate samples of 1 quart for each soil layer after mixing organic material and soil. The Soil Mix shall match the material being placed as closely as possible.

   C. A duplicate 1 quart sample of the soil mix and compost shall be sent to the soil consultant for review.

2. In-place Designed Soil Testing:

   A. General planting soil installation for planting beds and lawns shall be tested using a cone penetrometer with a ¾" cone or equivalent for approximately one point every 1000 sqft. The planting soil penetration resistance shall be uniformly increasing with depth, not exceeding 250 lbs/in2 to a depth of 30 inches. There shall not be any compacted dense layers greater than 50 lbs/in2 than background within the soil profile. The soil scientist will complete these tests during site visits. The contractor can also conduct penetration resistance tests to ensure compliance.

   B. In-place Density Tests for soils prescribed under sidewalks and pervious paving surfaces shall be conducted for at least three tests of surface soil density per segment.

   C. Planting Soil and Compost Submittal Acceptance: Submittals for planting soil Approval must have complete test results attached as specified for each soil, results shall be clearly marked for their corresponding soil layer, clearly labeled with the soil supplier's name, and receipt of soil samples by the Soil Scientist before review of the submittal can take place. Incomplete test results will not be reviewed delaying the approval process.

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D. Soil Installation Acceptance: Notify the soil scientist at least 10 calendar days in advance of date of soil placement. Inspection of the soil installation shall follow the recommendations of the soils scientist.

E. Partial Acceptance: Acceptance of partial areas or portions of the total work may be granted at the option of the Landscape Architect only if the area to be inspected for acceptance is large, well defined and easily described.

F. Final Acceptance: Final acceptance shall be defined as the date after which the Landscape Architect and Soil Scientist determine that all work, including Punch List items has been satisfactorily completed.

(b) *Handling and Storage.*

1. Store and handle packaged materials in strict compliance with manufacturer's instructions and recommendations. Protect all materials from weather, damage, injury and theft.

2. Completed planting soil mixes shall not be stockpiled longer than two weeks, whether on or off-site, shall not be placed in mounds greater than six feet high. If soil stockpiles greater than six feet high are to be stored for more than one month, the contractor shall break down and disperse soil so that mounds do not exceed the six-foot height restriction or thoroughly mix the stockpile once a month. Soils (especially topsoil) that are stored more than two months, further soil amendments may be needed upon installation. Soil Biology testing shall be required if planting soil components are stored in stockpiles for more than two months.

3. Soil materials shall be covered with waterproof tarps prior to predicted rain events for at least two weeks prior to installation and mixing to prevent saturation the soil stockpiles. Test for the moisture content of the soil mix using the gravimetric oven dry method as described in Soil Science Society of America, *Methods of Soil Analysis*, Part 1, 1986 at least two days prior to soil installation.

4. Soil materials shall not be handled or hauled, placed or compacted when it is wet, as after precipitation, nor when frozen. Soil shall be handled only when the moisture content is less than 8 percent by volume.

5. The planting soil shall be mixed in as uniformly homogenous mixture as possible. Recommend using either a ball mill or tub mill fitted with proper screening and paddles. Windrowing the materials is not acceptable, as it does not produce uniform mixing of the components.

(c) *Installation.*

1. Sequence deliveries to avoid delay. Deliver soil materials only after preparations for placement of planting soil have been completed.

2. Soils shall not be mixed or installed during heavy rainfall events (more than 4 hours of continuous rain) or during snowfall.

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3. Custom Growing Media Mix (soil) shall be placed carefully to avoid damage or displacement of other materials such as walls, paving, drainage components, filter fabric, and roofing waterproofing membrane. Soil shall be placed to within 1 inch greater than final grade or to a depth of no greater than 8 inches and compacted as described in herein. For final grades less than 8 inches only one round of compaction shall be performed and remaining soil loosely placed such that top of soil exceeds final grade by 1 inch. For final grades greater than 8 inches, place soil at no greater than 6 inches and repeat procedure until soil has been compacted within 1 inch of final grade.

   A. Compaction shall be performed with a 200 – 300 lb. landscape roller or lightly compacted with a hand held mechanical compactor to achieve a 85 % compaction as determined by ASTM D1557.

   B. After compaction remaining soil shall be placed at 1 inch greater than final grade and thoroughly watered or jetted over entire area. Low settled areas shall be filled with additional soil and re-wet to achieve uniform prescribed final grade.

519.16 Vegetation Installation.

(a) Plant materials shall not be installed between the fall frost date and the following spring frost date.

(b) Growing media shall be thoroughly watered and saturated immediately prior to installing new plant material.

519.17 Vegetation Maintenance.

(a) Maintenance activities shall include, but are not limited to, the following:

1. Periodic monitoring of vegetation

2. Watering to maintain proper growing media moisture content (especially during periods of hot and dry weather)

3. Weeding to remove unwanted vegetation from planted areas and vegetation free zones

4. Removal of debris

5. Reporting and photo-documentation of progress of vegetation until the end of the Landscape Warranty period (as described in Section 14.11 of this Section 14)

(b) Maintenance by the Developer shall begin immediately after vegetation installation and shall continue until the end of the Landscape Warranty period (as described in Section 14.11 of this Section 14).

519.18 Warranty.

(a) Provide a complete 30-year single source total system warranty of U.S. origin for all components of the Garden Roof Assembly that starts at the Final Acceptance Date. Warranty shall include the cost to repair or replace in the event the product fails to meet warranty. The warranty must include all

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repair and replacement costs for performing the work including all landscaping and aesthetic elements.

(b) Total System Warranty shall cover all components of the Garden Roof Assembly including; monolithic waterproofing membrane, reinforcing, flashing, protection course / root barrier protection – at landscape areas, protection course – at vehicular and pedestrian traffic areas, insulation: EPS geofoam, drainage / water retention components, filter fabrics, soil, garden roof accessory components, and erosion control materials. The warranty may not be prorated or place limitation on the Cover usage. Total System Warranty shall be provided in two separate forms as follow:

1. First warranty shall be provided for monolithic waterproofing membrane, reinforcing, flashing and protection course/root barrier protection – at landscape areas, protection course – at vehicular and pedestrian traffic areas. Warranty Beneficiary shall be CDOT and the Enterprises.

2. Second warranty shall be provided for insulation: EPS geofoam, drainage / water retention components, filter fabrics, soil, garden roof accessory components, and erosion control materials. Warranty Beneficiary shall be the City of Denver.

SECTION 520
ENGINEERED RESIN PANELS

Section 520 is hereby added to the Standard Specifications for the Project as follows:

DESCRIPTION

520.01 This work consists of furnishing and installing engineered resin panels constructed from polycarbonate, offering high design and performance appropriate for exterior architectural applications. Construction of engineered resin panels shall be at the locations, serving the functions intended, as shown in the I-70 Cover Panels provided in Schedule 10B.

MATERIALS

520.02 Material requirements.

a. Engineered resin panels shall be a minimum thickness of 1/2" (12.7 mm) thickness constructed from polycarbonate material;

b. Panels shall not have distortion in the form of a wrinkle, twist or scallop along the perimeter of the sheet. Overall warp extending across the sheet shall be less than 1/4" (6 mm) for each 48 inches. Measure panels laying horizontally under its own weight;

c. Panels shall be independently tested and meet the criteria for light transmitting resin materials as prescribed in the International Building Code and meet the requirements of the CCD Building Code requirements:

d. Panels be chemically resistant to harm incurred by cleaning agents;

e. Panels shall have been independently tested and meet the criteria for approved exterior finishes;

f. Panels shall incorporate ultraviolet stabilization technologies that are proven to maintain consistent aesthetics and performance. Materials shall demonstrate past use in a similar application for a period of not less than 10 years;

g. Panels shall maintain consistent light transmission with UV stabilization;

h. Demonstrate the abilities of the material to maintain its physical integrity after continuous exposure to solar radiation.

i. The Developer is responsible for providing the materials required for the Construction Work following industry best practices and the manufacturer recommendations.

520.03 Submittals.

a. The contractor shall submit manufacturers sample panel cut sheets with minimum 4' x 4' panel sheet for Department Acceptance. The sample panel shall include translucent and opaque materials for review.

b. Submit shop drawings of attachment details stamped by a licensed structural engineer for Information.

CONSTRUCTION REQUIREMENTS

520.03 The Developer is responsible for constructing engineered resin panels including attachment to structures following manufacturer recommendations and industry best practice.

Appendix B
Cover Specifications

The following specifications modify and take precedence over the Standard Specifications. The requirements of Appendix A to Schedule 10A Applicable Standards and Specifications apply to these Cover Specifications.

COVER SPECIFICATIONS

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

1. Walks
2. Walls
3. Footing
4. Curbs
5. Bands

B. Related Sections:

1. Section 03 3300 "Architectural Concrete" for general building applications of specialty finished formed concrete.
2. Section 31 2000 "Earth Moving" for drainage fill under slabs-on-grade.

1.3 DEFINITIONS

Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2. Design Mixtures for Credit ID 1.1: For each concrete mixture containing fly ash as a replacement for portland cement or other portland cement replacements, and for equivalent concrete mixtures that do not contain portland cement replacements.

C. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

Indicate amounts of mixing water to be withheld for later addition at Project site.

D. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

E. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.

Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.

F. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.

Location of construction joints is subject to approval of the Landscape Architect.

G. Samples: For waterstops vapor retarder.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Welding certificates.

C. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Waterstops.
6. Curing compounds.
7. Bonding agents.
8. Adhesives.
9. Vapor retarders.
10. Semirigid joint filler.
11. Joint-filler strips.
12. Repair materials.

D. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

E. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

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F. Field quality-control reports.

G. Minutes of pre-installation conference.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."

F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

G. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

H. Mockups: Cast concrete slab-on-grade and wall formed-surface panels to demonstrate typical joints, surface finish, texture, tolerances, floor treatments, and standard of workmanship.

1. Build panel approximately 200 sq. ft. for slab-on-grade and 100 sq. ft. for wall formed surface in the location indicated or, if not indicated, as directed by Architect.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

I. Pre-installation Conference: Conduct conference at Project site.

1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

   a. Contractor's superintendent.
   b. Independent testing agency responsible for concrete design mixtures.
   c. Ready-mix concrete manufacturer.
   d. Concrete subcontractor.
   e. Special concrete finish subcontractor.

2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, forms and form removal limitations, vapor-retarder installation, steel reinforcement installation, concrete repair procedures, and concrete protection.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.

2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
   a. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal. 1 inch wide at face by 3/4 inch deep 'V' shape.

E. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

Formulate form-release agent with rust inhibitor for steel form-facing materials.

F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.

2.2 STEEL REINFORCEMENT

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

C. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.

D. Galvanized Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed bars, ASTM A 767/A 767M, Class I zinc coated after fabrication and bending.

E. Epoxy-Coated Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed bars, epoxy coated, with less than 2 percent damaged coating in each 12-inch bar length.

F. Plain-Steel Wire: ASTM A 82/A 82M, galvanized.

G. Deformed-Steel Wire: ASTM A 496/A 496M.

H. Epoxy-Coated Wire: ASTM A 884/A 884M, Class A, Type 1 coated, deformed-steel wire, with less than 2 percent damaged coating in each 12-inch wire length.

I. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

J. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.

K. Galvanized-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from galvanized-steel wire into flat sheets.

L. Epoxy-Coated Welded Wire Reinforcement: ASTM A 884/A 884M, Class A coated, Type 1, plain steel.

2.3 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.

B. Epoxy-Coated Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, ASTM A 775/A 775M epoxy coated.

C. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on reinforcement and complying with ASTM A 775/A 775M.

D. Zinc Repair Material: ASTM A 780, zinc-based solder, paint containing zinc dust, or sprayed zinc.

E. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

2.4 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type I/II, gray. Supplement with the following:
   a. Fly Ash: ASTM C 618, Class F.
   b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

2. Blended Hydraulic Cement: ASTM C 595, Type IS, portland blast-furnace slag cement.

B. Silica Fume: ASTM C 1240, amorphous silica.

C. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Water: ASTM C 94/C 94M and potable.

2.5 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.6 WATERSTOPS

Flexible Rubber Waterstops: CE CRD-C 513, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

2.7 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.

B. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100 percent passing a 3/8-inch sieve, 10 to 30 percent passing a No. 100 sieve, and at least 5 percent passing No. 200 sieve; complying with deleterious substance limits of ASTM C 33 for fine aggregates.

2.8 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

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Products: Subject to compliance with requirements, available products that may be

2.9 RELATED MATERIALS

A. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

B. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:

Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.10 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.11 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 25 percent.
2. Combined Fly Ash and Pozzolan: 25 percent.
3. Ground Granulated Blast-Furnace Slag: 50 percent.
4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
5. Silica Fume: 10 percent.
6. Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
7. Combined Fly Ash or Pozzolans, Ground Granulated Blast-Furnace Slag, and Silica Fume: 50 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

E. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.12 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.13 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M, and furnish batch ticket information.

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When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:

Class A, 1/8 inch for smooth-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

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L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
3. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

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C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

F. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M. Use epoxy-coated steel wire ties to fasten epoxy-coated steel reinforcement.

G. Zinc-Coated Reinforcement: Repair cut and damaged zinc coatings with zinc repair material according to ASTM A 780. Use galvanized steel wire ties to fasten zinc-coated steel reinforcement.

3.5 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
6. Use rustication strips for vertical joints as indicated for surfaces exposes to public view.
7. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
8. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

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3.6 WATERSTOPS

A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.

B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.7 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.

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4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

G. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.8 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

Apply to concrete surfaces not exposed to public view, core wall, spread footers.

B. Light Sandblast or Sandscape Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

Apply to all concrete wall surfaces exposed to public view

C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

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D. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture

1. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.
2. Apply to all concrete stairs exposed to public view.

3.9 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
   a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
   b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.

c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

   Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.10 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

   Defer joint filling until concrete has aged at least one month(s). Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening. Seal all vertical joints with silicone.

3.11 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

   1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes

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and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

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F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.12 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

C. Inspections:

1. Steel reinforcement placement.
2. Steel reinforcement welding.
3. Headed bolts and studs.
4. Verification of use of required design mixture.
5. Concrete placement, including conveying and depositing.
6. Curing procedures and maintenance of curing temperature.
7. Verification of concrete strength before removal of shores and forms from beams and slabs.

D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.
   When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
3. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
4. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
5. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
6. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
7. Compression Test Specimens: ASTM C 31/C 31M.

a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.

8. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
   a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
   b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
11. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
12. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
13. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
14. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
15. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

E. Measure floor and slab flatness and levelness according to ASTM E 1155 within 24 hours of finishing.

END OF SECTION

SECTION 12 9300
SITE FURNISHINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

Section Includes:

1. Benches
2. Bicycle racks
3. Trash receptacles / recycling
4. Tables and Chairs
5. Tree grates
6. Removable bollards
7. Drinking fountain

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals:

1. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2. Certificates for Credit MR 6 and Credit MR 7: Chain-of-custody certificates indicating that wood components of site furnishings comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.

C. Samples: For each exposed product and for each color and texture specified.

D. Samples for Initial Selection: For units with factory-applied finishes.

E. Samples for Verification: For each type of exposed finish, not less than 6-inch- long linear components and 4-inch- square sheet components.

F. Product Schedule: For site furnishings. Use same designations indicated on Drawings.

1.4 CLOSEOUT SUBMITTALS

Maintenance Data: For site furnishings to include in maintenance manuals.

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SECTION 12 9300
SITE FURNISHINGS

1.5 MAINTENANCE MATERIAL SUBMITTALS

Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Bench Replacement Slats: No fewer than twelve full-size units for each size indicated.
2. Trash/Recycling Receptacle Inner Containers: Five full-size units for each size indicated, but no fewer than two units.

PART 2 - PRODUCTS

2.1 BENCH

Style:

1. Backless
   a. Minimum depth: 20”
   b. Maximum seat height: 22”
   c. Minimum length: 72”
   d. Arms provided every 36” on benches greater than 72” in length

2. Backed
   a. Minimum depth: 20”
   b. Maximum seat height: 22”
   c. Minimum length: 72”
   d. Arms provided every 36” on benches greater than 72” in length

3. Mounting: Surface mount

4. Materials and Finishes:
   a. Seat Panels/Slats: Powdercoated aluminum, powdercoated steel or stainless steel
   b. Back Panels/Slats: Powdercoated aluminum, powdercoated steel or stainless steel
   c. Frame and Legs: Powdercoated aluminum, powdercoated steel or stainless steel

5. Anchor Bolts:
   Corrosion resistant

6. Skateboard deterrents are to be provided on benches where arms are not used

2.2 BIKE RACK

A. Style 1 - Standard:
   1. Size:
      a. Minimum/Maximum Depth: 1.5”/2.0”
      b. Minimum/Maximum Height: 28”/36”
      c. Minimum/Maximum Length: 24”/30”

   2. Mounting: Embedded

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SITE FURNISHINGS

3. Materials and Finishes: Powdercoated aluminum, powdercoated steel or stainless steel

B. Style 2 - Bike Share: Developer to coordinate appropriate capacity and location with B-Cycle or other community bike share provider.

2.3 TRASH RECEPTACLE / RECYCLING

A. Style 1 - Standard:
1. Trash receptacle: top opening, minimum 10” diameter
2. Recycling receptacle: top opening, 5” – 6” diameter
3. Size:32 gallon
4. Materials and Finish: Powdercoated aluminum, powdercoated steel or stainless steel
5. Mounting: Surface mount
6. Instructional graphics - apply instructional graphics to lids as specified to indicate the intended waste or recycling stream
   a. Graphics type: back-printed polycarbonate
   b. Letters and symbols color: White
   c. Graphics background colors: Blue

B. Style 2 – Solar-Powered Compacting
1. Trash receptacle: side-opening, minimum 6” x 17”
2. Recycling receptacle (single-stream): side-opening, bottle/can opening minimum 5” diameter, paper opening minimum 1.75” x 10”
3. Size: 32 gallon minimum
4. Mounting: Surface mount
5. Instructional Graphics – apply graphics to containers to indicate the intended waste or recycling streams

2.4 TABLES AND CHAIRS

Style:
1. Size:
   a. Tables:
      1) Minimum/maximum height: 28”/34”
      2) Minimum/maximum diameter: 30”/48”

   b. Chairs:
      Minimum/maximum seat height: 18”/22”

   c. Picnic:
      1) Minimum/maximum seat height: 18”/22”
      2) Minimum/maximum table height: 28”/34”
      3) Minimum table width: 30”
      4) Minimum length: 72”

2. Materials and Finishes: Powdercoated aluminum, powdercoated steel or stainless steel

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3. Mounting:
   a. Tables: Embedded, surface mount or movable
   b. Chairs: Embedded, surface mount or moveable
   c. Picnic: Embedded or surface mount

2.5 TREE GRATES

Style:
1. Size: 5’ x 15’ minimum
2. Materials and Finishes: Recycled Grey Iron, Ductile Iron, Recycled Aluminum, Silicon Bronze or Nickel Bronze

2.6 REMOVABLE BOLLARD

Style:
1. Size:
   a. Minimum/Maximum Height: 24”/36” as measured above surrounding pavement
   b. Minimum/Maximum Diameter: 4”/5”

2. Mounting: Removable, with recessed locking mechanism
3. Materials and Finishes: Powdercoated steel or stainless steel

2.7 DRINKING FOUNTAIN

Style:Drinking fountain to include the following:
1. Min. 1 fountain mounted at ADA-required mounting height with minimum clearances as define by ADA
2. Min. 1 bottle-filling fountain
3. Min. 1 pet bowl
4. Anti-freeze protection

2.8 FABRICATION

A. Exposed Surfaces: Polished, sanded, or otherwise finished; all surfaces smooth, free of burrs, barbs, splinters, and sharpness; all edges and ends rolled, rounded, or capped.

B. Factory Assembly: Assemble components in the factory to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

2.9 GENERAL FINISH REQUIREMENTS

Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

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SECTION 12 9300
SITE FURNISHINGS

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.

B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.

C. Install site furnishings level, plumb, true, and securely anchored or positioned at locations indicated on Drawings.

END OF SECTION

SECTION 32 1313
CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

Walks.

B. Related Sections:

Section 033000 "Cast-in-Place Concrete" for general building applications of concrete.

1.3 DEFINITIONS

Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2. Design Mixtures for Credit ID 1: For each concrete mixture containing fly ash as a replacement for portland cement or other portland cement replacements. For each design mixture submitted, include an equivalent concrete mixture that does not contain portland cement replacements, to determine amount of portland cement replaced.

C. Shop Drawings: Indicate pavement markings, lane separations, and defined parking spaces. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.

D. Samples for Initial Selection: For each type of product, ingredient, or admixture requiring color selection.

E. Samples for Verification: For each type of product or exposed finish, prepared as Samples of size indicated below:

Exposed Aggregate: 10-lb Sample of each mix.

F. Other Action Submittals:

Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified ready-mix concrete manufacturer and testing agency.

B. Material Certificates: For the following, from manufacturer:

1. Cementitious materials.
2. Steel reinforcement and reinforcement accessories.
3. Admixtures.
4. Curing compounds.
5. Applied finish materials.
6. Bonding agent or epoxy adhesive.
7. Joint fillers.

C. Material Test Reports: For each of the following:

Aggregates. Include service-record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.

D. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Detectable Warning Installer Qualifications: An employer of workers trained and approved by manufacturer of stamped concrete paving systems.

B. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").

C. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

D. Concrete Testing Service: Engage a qualified testing agency to perform material evaluation tests and to design concrete mixtures.

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CONCRETE PAVING

E. ACI Publications: Comply with ACI 301 unless otherwise indicated.

F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockups of full-thickness sections of concrete paving to demonstrate typical joints; surface finish, texture, and color; curing; and standard of workmanship.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

G. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to concrete paving, including but not limited to, the following:
   a. Concrete mixture design.
   b. Quality control of concrete materials and concrete paving construction practices.
2. Require representatives of each entity directly concerned with concrete paving to attend, including the following:
   a. Contractor's superintendent.
   b. Independent testing agency responsible for concrete design mixtures.
   c. Ready-mix concrete manufacturer.
   d. Concrete paving subcontractor.
   e. Manufacturer's representative of stamped concrete paving system used for detectable warnings.

1.7 PROJECT CONDITIONS

Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.

Use flexible or uniformly curved forms for curves with a radius of 100 feet or less. Do not use notched and bent forms.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

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CONCRETE PAVING

2.2 STEEL REINFORCEMENT

A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, fabricated from galvanized-steel wire into flat sheets.

C. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.

D. Epoxy-Coated Welded Wire Reinforcement: ASTM A 884/A 884M, Class A, plain steel.

E. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.

F. Galvanized Reinforcing Bars: ASTM A 767/A 767M, Class II zinc coated, hot-dip galvanized after fabrication and bending; with ASTM A 615/A 615M, Grade 60 deformed bars.

G. Deformed-Steel Wire: ASTM A 496/A 496M.

H. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 plain-steel bars; zinc coated (galvanized) after fabrication according to ASTM A 767/A 767M, Class I coating. Cut bars true to length with ends square and free of burrs.

I. Tie Bars: ASTM A 615/A 615M, Grade 60, deformed.

J. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:

1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

K. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating, compatible with epoxy coating on reinforcement.

L. Zinc Repair Material: ASTM A 780.

2.3 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of same type, brand, and source throughout Project:

1. Portland Cement: ASTM C 150, white portland cement Type I/II. Supplement with the following:
   a. Fly Ash: ASTM C 618, Class F.
   b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
2. Blended Hydraulic Cement: ASTM C 595, Type IS, portland blast-furnace slag cement.

B. Normal-Weight Aggregates: ASTM C 33, Class 4S, uniformly graded. Provide aggregates from a single source with documented service-record data of at least 10 years' satisfactory service in similar paving applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: 1 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: Potable and complying with ASTM C 94/C 94M.

D. Air-Entraining Admixture: ASTM C 260.

E. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.4 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.

Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Axim Italcementi Group, Inc.; Caltexol CIMFILM.
b. BASF Construction Chemicals, LLC; Confilm.
c. ChemMasters; Spray-Film.

d. Conspec by Dayton Superior; Aquafilm.
e. Dayton Superior Corporation; Sure Film (J-74).
f. Edoco by Dayton Superior; BurkeFilm.
g. Euclid Chemical Company (The), an RPM company; Eucobar.
h. Kaufman Products, Inc.; VaporAid.
i. Lambert Corporation; LAMBCO Skin.
j. L&M Construction Chemicals, Inc.; E-CON.
k. Meadows, W. R., Inc.; EVAPRE.
l. Metalcrete Industries; Waterhold.
m. Nox-Crete Products Group; MONOFILM.
n. Sika Corporation, Inc.; SikaFilm.

2.5 RELATED MATERIALS

A. Joint Fillers: ASTM D 1751, asphalt-saturated cellulosic fiber in preformed strips.

B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

C. Epoxy Bonding Adhesive: ASTM C 881/C 881M, two-component epoxy resin capable of humid curing and bonding to damp surfaces; of class suitable for application temperature, of grade complying with requirements, and of the following types:

Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.6 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.

1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.
2. When automatic machine placement is used, determine design mixtures and obtain laboratory test results that meet or exceed requirements.

B. Proportion mixtures to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 4500 psi.
2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.45.
3. Slump Limit: 4 inches, plus or minus 1 inch.

C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:

Air Content: 6 percent plus or minus 1.5 percent for 1-inch nominal maximum aggregate size.

D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

E. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.

Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

F. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.

2.7 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M. Furnish batch certificates for each batch discharged and used in the Work.

When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For concrete batches of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For concrete batches larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding.

1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph.

2. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch according to requirements in Section 312000 "Earth Moving."

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.

When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.

1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.
2. Provide tie bars at sides of paving strips where indicated.
3. Butt Joints: Use bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
4. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 50 feet unless otherwise indicated.
2. Extend joint fillers full width and depth of joint.
3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.

4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
6. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows, to match jointing of existing adjacent concrete paving:

1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
   Tolerance: Ensure that sawed joints are within 3 inches either way from centers of dowels.
2. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

3.5 CONCRETE PLACEMENT

A. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in.

B. Remove snow, ice, or frost from subbase surface and steel reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.

F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

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CONCRETE PAVING

G. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement joint devices.

H. Screed paving surface with a straightedge and strike off.

I. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

J. Cold-Weather Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:

1. When air temperature has fallen to or is expected to fall below 40 °F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 °F and not more than 80 °F at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.

K. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 °F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.6 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. FINISH TYPE A

Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to

power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.

C. FINISH TYPE B

1. Sandscape Texture™ Finish or equal approved by Landscape Architect:
   a. The areas to receive Sandscape Texture™ concrete shall have the sub-grade prepared as required as for any concrete slab on grade.
   b. The formwork shall be installed in accordance with the drawings. The slab thickness shall be consistent with that of ordinary concrete slabs under the same conditions.
   c. Provide reinforcement as specified.
   d. Control joints and/or expansion joints shall be provided in accordance with the drawings and the guidelines established by the American Concrete Institute. As with any concrete slab, Sandscape Texture™ concrete usually contains construction joints, control joints and expansion joints. The contractor shall advise and work with the Landscape Architect/engineer to determine the best location for these joints to minimize the visibility of the joints and to minimize unsightly cracking.
   e. All concrete flatwork shall be performed under the direct supervision of a Craftsman holding the following certificate: American Concrete Institute (ACI) Concrete Flatwork Finisher and Technician (ACICFFT). A minimum of one certified Craftsman is required at each finishing operation.
   f. The concrete shall be placed and screeded to the finished grade, and floated to a uniform surface using standard finishing techniques.
   g. Surface Treatment will be applied and cleaned off with proper equipment.
   h. After the initial curing period the surface of the slab shall be sealed.

3.7 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

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CONCRETE PAVING

E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing or a combination of these as follows:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
2. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas that have been subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating, and repair damage during curing period.

3.8 PAVING TOLERANCES

Comply with tolerances in ACI 117 and as follows:

1. Elevation: 3/4 inch.
2. Thickness: Plus 3/8 inch, minus 1/4 inch.
3. Surface: Gap below 10-foot- long, unleveled straightedge not to exceed 1/2 inch.
4. Alignment of Tie-Bar End Relative to Line Perpendicular to Paving Edge: 1/2 inch per 12 inches of tie bar.
5. Lateral Alignment and Spacing of Dowels: 1 inch.
6. Vertical Alignment of Dowels: 1/4 inch.
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge: 1/4 inch per 12 inches of dowel.
8. Joint Spacing: 3 inches.
9. Contraction Joint Depth: Plus 1/4 inch, no minus.
10. Joint Width: Plus 1/8 inch, no minus.

3.9 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.
   a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.

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3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when it is 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at seven days and two specimens at 28 days.
   A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.

G. Concrete paving will be considered defective if it does not pass tests and inspections.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

I. Prepare test and inspection reports.

3.10 REPAIRS AND PROTECTION

A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.

B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.

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CONCRETE PAVING

C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION

SECTION 32 1400
UNIT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

Section Includes:

1. Concrete unit pavers set in aggregate setting beds.
2. Stone pavers set in sand setting bed over concrete subslab.

1.3 PRECONSTRUCTION TESTING

Preconstruction Adhesion and Compatibility Testing: Submit to latex-additive manufacturer, for testing as indicated below, samples of paving materials that will contact or affect mortar and grout that contain latex additives.

Use manufacturer's standard test methods to determine whether mortar and grout materials will obtain optimum adhesion with, and will be nonstaining to, installed pavers and other materials constituting paver installation.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

1. Concrete Unit Pavers.
2. Edge restraints.

B. LEED Submittals:

Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.

C. Sieve Analyses: For aggregate setting-bed materials, according to ASTM C 136.

D. Samples for Verification:

1. Full-size units of each type, color and finish of unit paver indicated.
2. Joint materials.

SECTION 32 1400
UNIT PAVING

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of unit paver, joint material, and setting material from single source with resources to provide materials and products of consistent quality in appearance and physical properties.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

C. Preinstallation Conference: Conduct conference at Project site.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store pavers on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied.

B. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

C. Store liquids in tightly closed containers protected from freezing.

1.7 PROJECT CONDITIONS

Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.

PART 2 - PRODUCTS

2.1 CONCRETE/STONE PAVERS

Concrete/Stone Pavers: Solid paving units, made from normal-weight concrete or natural stone with a compressive strength not less than 8000 psi, water absorption not more than 5 percent according to ASTM C 140, and no breakage and not more than 1 percent mass loss when tested for freeze-thaw resistance according to ASTM C 67.

1. Style: Type 1
   a. Face Size and Shape: 12” x 24” nominal
   b. Thickness:
      1) Vehicular areas: minimum 2 ¾ inches thick
      2) Non-vehicular areas: minimum 2 inches thick

2. Style: Type 2
   a. Face Size and Shape: 6” x 16” nominal
   b. Thickness:

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SECTION 32 1400
UNIT PAVING

1) Vehicular areas: minimum 2 ¾ inches thick
2) Non-vehicular areas: minimum 2 inches thick

3. Style: Type 2
   a. Face Size and Shape: 6” x 16” nominal
   b. Thickness:
      1) Vehicular areas: minimum 2 ¾ inches thick
      2) Non-vehicular areas: minimum 2 inches thick

2.2 CURBS AND EDGE RESTRAINTS

A. Job-Built Concrete Flush Curb, per plans: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mixed concrete with minimum 28-day compressive strength of 4500 psi.

B. Precast Concrete Flush Curb, per plans

2.3 ACCESSORIES

A. Cork Joint Filler: Preformed strips complying with ASTM D 1752, Type II.

B. Compressible Foam Filler: Preformed strips complying with ASTM D 1056, Grade 2A1.

2.4 AGGREGATE SETTING-BED MATERIALS

A. Base Course: refer to garden roof assembly specification for base course instructions.

B. Sand for Leveling Course: Sound, sharp, washed, natural sand or crushed stone complying with gradation requirements in ASTM C 33 for fine aggregate.

C. Stone Screenings for Leveling Course: Sound stone screenings complying with ASTM D 448 for Size No. 10.

D. Sand for Joints: Fine, sharp, washed, natural sand or crushed stone with 100 percent passing No. 16 sieve and no more than 10 percent passing No. 200 sieve.

E. Drainage Geotextile: Nonwoven needle-punched geotextile fabric, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Grab Tensile Strength: 120 lbs; ASTM D4632
2. Apparent Opening Size: No. 40 sieve, maximum; ASTM D 4751.
3. Permittivity: 0.5 per second, minimum; ASTM D 4491.
4. UV Stability: 50 percent after 500 hours' exposure, ASTM D 4355.

F. Geosynthetic: Woven geotextile fabric, manufactured for separation and reinforcement applications; made from high-tenacity polypropylene yarns; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Tensile Strength (at ultimate): 2640 lbs/ft; ASTM D4595
2. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
3. Permittivity: 0.7 per second, minimum; ASTM D 4491.
4. UV Stability: 50 percent after 500 hours' exposure, ASTM D 4355.

G. Herbicide: Commercial chemical for weed control, registered with the EPA. Provide in granular, liquid, or wettable powder form.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas indicated to receive paving, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Where pavers are to be installed over waterproofing, examine waterproofing installation, with waterproofing Installer present, for protection from paving operations, including areas where waterproofing system is turned up or flashed against vertical surfaces.

C. Proceed with installation only after unsatisfactory conditions have been corrected and waterproofing protection is in place.

3.2 PREPARATION

A. Remove substances from concrete substrates that could impair mortar bond, including curing and sealing compounds, form oil, and laitance.

B. Sweep concrete substrates to remove dirt, dust, debris, and loose particles.

C. Proof-roll prepared subgrade according to requirements in Section 312000 "Earth Moving" to identify soft pockets and areas of excess yielding. Proceed with unit paver installation only after deficient subgrades have been corrected and are ready to receive subbase and base course for unit pavers.

3.3 INSTALLATION, GENERAL

A. Do not use pavers with chips, cracks, voids, discolorations, or other defects that might be visible or cause staining in finished work.

B. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.

C. Cut pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.

For concrete pavers, a block splitter may be used.

D. Joint Pattern: As indicated.

E. Pavers over Waterproofing: Exercise care in placing pavers and setting materials over waterproofing so protection materials are not displaced and waterproofing is not punctured or otherwise damaged. Carefully replace protection materials that become displaced and arrange for repair of damaged waterproofing before covering with paving.

Provide joint filler at waterproofing that is turned up on vertical surfaces unless otherwise indicated; where unfilled joints are indicated, provide temporary filler or protection until paver installation is complete.

F. Tolerances: Do not exceed 1/16-inch unit-to-unit offset from flush (lippage) nor 1/8 inch in 24 inches and 1/4 inch in 10 feet from level, or indicated slope, for finished surface of paving.

G. Expansion and Control Joints: Provide for sealant-filled joints at locations and of widths indicated. Provide compressible foam filler as backing for sealant-filled joints unless otherwise indicated; where unfilled joints are indicated, provide temporary filler until paver installation is complete. Install joint filler before setting pavers. Sealant materials and installation are specified in Section 079200 "Joint Sealants."

H. Expansion and Control Joints: Provide cork joint filler at locations and of widths indicated. Install joint filler before setting pavers. Make top of joint filler flush with top of pavers.

I. Provide edge restraints as indicated. Install edge restraints before placing unit pavers.

Construct edge restraints to comply with drawings.

3.4 REPAIRING, POINTING, AND CLEANING

A. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.

B. Pointing: During tooling of joints, enlarge voids or holes and completely fill with grout. Point joints at sealant joints to provide a neat, uniform appearance, properly prepared for sealant application.

C. Cleaning: Remove excess grout from exposed paver surfaces; wash and scrub clean.

1. Remove temporary protective coating as recommended by coating manufacturer and as acceptable to paver and grout manufacturers.

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UNIT PAVING

2. Do not allow protective coating to enter floor drains. Trap, collect, and remove coating material.

END OF SECTION

SECTION 32 1816.13
PLAYGROUND PROTECTIVE SURFACING

PART 1 - GENERAL

1.1 SUMMARY

Section Includes:

Engineered Wood Fiber Play Surfaces

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Verification

1.3 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws if applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk materials with appropriate certificates.

PART 2 - PRODUCTS

2.1 ENGINEERED WOOD FIBER PLAY SURFACES

A. Provide engineered wood fiber play surfaces in areas indicated on plans

B. The amount of engineered wood fiber play surface depth is to be a minimum of 8” after compaction.

C. Provide rubberized wear mat (minimum size: 36” x 36” x 1.5”) with beveled edge on all sides under each swing seat, tire swing, slide exist and sliding pole. Double and triple slides may require multiple wear mats.

PART 3 - QUALITY CONTROL

3.1 Surfacing shall be IPEMA-certified engineered wood fiber. Standard wood chips or bark mulch will not be acceptable.

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PLAYGROUND PROTECTIVE SURFACING

3.2 Supplier must provide test results for engineered wood fiber and wear mats for impact attenuation in accordance with ASTM F 1292.

3.3 Testing of engineered wood fiber in accordance with ASTM F 1292 must show G-max values of less than 155G for an 8" thick system.

3.4 Supplier must provide test results for the engineered wood fiber in accordance with ASTM D 2075.

3.5 Testing of wear mats in accordance with ASTM F 1292 must show values of less than 200G and HIC values of less than 1,000 for a 3' drop height.

3.6 Supplier must provide test results in accordance with ASTM F 1951.

3.7 Supplier must certify that the surface meets the intent of the Americans with Disabilities Act (ADA).

END OF SECTION

SECTION 32 1823
SYNTHETIC TURF SURFACING

PART 1 GENERAL

1.01 QUALITY ASSURANCE

(a) The synthetic turf manufacturer must have a minimum of 5 years' experience.

(b) The synthetic turf installer must have a minimum of 5 years' experience and have installed a minimum of 5 acceptable installations of comparable size within the last 3 years.

(c) Do not apply adhesive if temperatures are expected to go below 40 degrees within a 24 hour period.

(d) Synthetic Turf Underlayment (shock pad):

1. Subgrade verification: Contractor shall provide a surveyed verification of grades on a 10' grid across the synthetic turf subgrade leveling course. Local soil contour after final grading and compaction shall not have deviations in surface shape greater than 1/4" over a 10' span. (+/- 1/8").
2. Stringline verification: Contractor shall verify leveling course contour using "string line" method: Lengths of 50' – 100' pulled taught with high/low spots marked and hand-dressed prior to installation of synthetic turf underlayment (shock pad).
3. The manufacturer must demonstrate successful installations for at least 5 million square feet of the material specified herein and a minimum 10 installations within the state of Colorado.
4. Use only new materials manufactured and shipped for the specific installation. No used, recycled or refurbished materials are to be installed. Manufacturer must provide documentation of material content and MSDS sheet for submittal package.
5. Synthetic turf underlayment material shall be shipped as flat panels on prepackaged pallets. Pallets to be wrapped with heavy-duty barrier for protection from moisture and UV exposure. Contractor shall not unwrap packaging until installation period.
6. Manufacturer shall provide written and video procedures to selected turf supplier for installation of turf over the underlayment.
7. Seams shall be mechanically locked into place by hand without use of additional materials, glue, fasteners, or secondary processes and equipment.
8. Install per manufacturer's guidelines.

1.02 WARRANTY

(a) The warranty shall guarantee the usability and playability of the synthetic turf for its intended uses for an eight year period starting at the Final Acceptance Date.

(b) Synthetic Turf Underlayment (shock pad): Provide complete 25-year product warranty that starts at the Final Acceptance Date. Warranty will include the cost to repair or replace the shock pad in the event the product fails to meet warranty. The warranty must also include a field maximum GMax limit of 120 Gs for the usable life of the artificial turf.

(c) The warranty may not be prorated or place limitation on the field's usage.

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SECTION 32 1823
SYNTHETIC TURF SURFACING

PART 2 PRODUCTS

2.01 MATERIALS

A. Components:

1. A carpet made of polyethylene fibers tufted into a fibrous, perforated or permeable backing.
2. The infill should be 100% rounded and highly uniform quartz sand, pigmented and sealed with an acrylic polymer that partially covers the carpet.
3. Glue, paint, thread, seaming fabric and materials used to install/mark the synthetic turf. 4. A synthetic turf underlayment (shock pad) made of resilient polypropylene.

B. Monofilament Synthetic Turf.

1. Fiber Denier: 9,000 dtex minimum.
2. Structure: Straight Monofilament.
3. Yarn Thickness: 120 – 80 microns.
4. Yarn Width: 1 mm.
5. Yarn Tensile Strength: 135 N, Minimum.
6. Tuft Gauge: 3/4 inch maximum.
7. Face Weight: 45 oz. minimum
8. Pile Height (consistent throughout material): 1 5/8 inch
9. Primary Backing: Two part composite, comprised of both woven and non-woven components.
10. Primary Backing Weight: 8 oz/sy, minimum.
11. Primary Backing Dimensional Stability: 47.10 n/SQ. Meter.
12. Secondary Backing Coating: Solid polyurethane.
13. Secondary Backing Coating Weight: 26 oz/sy, minimum.
14. Backing Tear Strength - Grab Tear Strength: (X-Y) > 250-400 lbs.
15. Perforated Backing: ¼ inch minimum holes at 3inch o.c. both directions.

C. Dual Fiber Synthetic Turf:

1. Fiber Denier: 9,000 dtex minimum.
2. Structure: Straight Monofilament.
3. Yarn Thickness: 120 – 80 microns.
4. Yarn Width: 1 mm.
5. Yarn Tensile Strength: 135 N, Minimum.
6. Tuft Gauge: 3/8 inch maximum.
7. Face Weight: 45 oz. minimum. 52 oz. maximum
8. Pile Height (consistent throughout material): 1 5/8 inch
9. Primary Backing: Two part composite, comprised of both woven and non-woven components.
10. Primary Backing Weight: 8 oz/sy, minimum.
11. Primary Backing Dimensional Stability: 47.10 n/SQ. Meter.
12. Secondary Backing Coating: Solid polyurethane.

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SYNTHETIC TURF SURFACING

13. Secondary Backing Coating Weight: 26 oz/sy, minimum.
14. Backing Tear Strength - Grab Tear Strength: (X-Y) > 250-400 lbs.
15. Perforated Backing: ¼ inch minimum holes at 3inch o.c. both directions.

D. Slit Film Synthetic Turf:

1. Fiber Denier: 9,000 dtex minimum.
2. Structure: Fibrillated Tape.
3. Yarn Thickness: 120 – 80 microns.
4. Yarn Width: 17 mm.
5. Yarn Tensile Strength: 135 N, Minimum.
6. Tuft Gauge: 3/8 inch maximum.
7. Face Weight: 45 oz. minimum. 52 oz. maximum
8. Pile Height (consistent throughout material):1 5/8 inch
9. Primary Backing: Two part composite, comprised of both woven and non-woven components.
10. Primary Backing Weight: 8 oz/sy, minimum.
11. Primary Backing Dimensional Stability: 47.10 n/SQ. Meter.
12. Secondary Backing Coating: Solid polyurethane.
13. Secondary Backing Coating Weight: 26 oz/sy, minimum.
14. Backing Tear Strength - Grab Tear Strength: (X-Y) > 250-400 lbs.
15. Perforated Backing: ¼ inch minimum holes at 3inch o.c. both directions.

E. Infill:

Top Layer: Sealed Silica Sand

a) Material shall be specifically designed and manufactured for athletic use. It shall be a rounded and highly uniform quartz sand pigmented and sealed with an acrylic polymer.
b) The coated particles shall be smooth to resist mounding and compaction.
c) The finished product shall be 100% coated, shall repel water, be non-flammable and have <.001% dust content.
d) Coefficient of Uniformity: ≤ 1.3.
e) Sieve Size (95% Minimum): 12 - 20.
f) Angle of repose: ≤ 30 degrees
g) Abrasion Index of 26±2.
h) Color: Green or Tan
i) Acceptable Products
    i) Envirofill
    ii) Accepted substitution. If the bidding contractor does not identify a manufacturer, it will be assumed that the specified product is included in the bid package and will not consider substitutions. Proposed alternate products must be submitted and pre-accepted by the design architect/engineer prior to the bid opening per section 01 25 00.

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SECTION 32 1823
SYNTHETIC TURF SURFACING

F. At sports field, carpet shall be furnished in 15' wide rolls, and shall be long enough to extend sideline to sideline without splicing.

G. At non-sports field installations, carpet shall be in as large of pieces as practical with a minimum of seams. No seams allowed within 24inch (parallel) of edges.

H. Synthetic Turf Underlayment (shock pad):

1. Synthetic turf underlayment shall be an impact energy absorbing drainage material specifically designed for use with synthetic turf.
2. The material must have both impact absorption and drainage properties that meet the following performance requirements:
   a) Vertical drainage: 50 in/hr, minimum per EN12616
   b) Surface contact: 50% minimum contact with synthetic turf backing
   c) Friction coefficient: Movement of artificial turf over 50 mm distance must require a minimum of 8.92 N of force per ISO 8295:2010
   d) Thermal stability: Not to exceed 3 mm per 30 degree C change
   e) Tensile strength: 100 psi, minimum
   f) Provide field maximum average Gmax of no greater than 120 during the warranty period of the turf. (system test under infill turf)
   g) Field must pass ASTM 1292 and produce a minimum 1.3 meter (4 feet 3") critical fall height. (WR Reg22)
   h) Bacteria and fungi resistance: Pass per ASTM G22-76
   i) Chemical resistance: No change to material under total saturation of the following chemicals:
      i) Gasoline
      ii) Brake fluid
      iii) Chlorine
      iv) Underbody coating
      v) Transmission fluid
      vi) Motor oil
      vii) Zinc chloride
      viii) Tar and oil solvents
      ix) Windshield washer fluid
      x) Kerosene
      xi) Ethylene and propylene glycols
   j) Product must carry a 25-year product warranty that includes the removal and repair or replacement of the artificial turf in the event underlayment fails to meet warranty claims.
   k) Material must be 100% recyclable (recycling for energy not acceptable)
   l) Cradle to Cradle Certification preferred
   m) USA Made preferred
   n) Material must not absorb water. Open cell foams not accepted.
   o) Product must be made from 100% virgin material with no recycled content
   p) Panel thickness: 23 mm (+/- 1 mm)

3. Acceptable products

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SECTION 32 1823
SYNTHETIC TURF SURFACING

a) Brock PowerBase YSR
b) Accepted substitution. If the bidding contractor does not identify a manufacturer, it will be assumed that the specified product is included in the bid package and will not consider substitutions. Proposed alternate products must be submitted and pre-accepted by the design architect/engineer prior to the bid opening per section 01 25 00. Any substitutions that present a cost reduction to the owner, said cost reduction must be credited back to owner.

B. Surplus Material: The turf contractor shall provide the following surplus material with each installation, to be stored at the manufacturer's or installer's facility.

1. Turf Fabric: 5% extra by square footage.
2. Seaming Tape: 5%.
3. Seaming Epoxy: 5%.
4. Synthetic Turf Underlayment (shock pad): 1000 extra square feet.

C. Nyloplast drainage or similar systems for athletic field storm drainage systems.

PART 3 EXECUTION

3.01 EXECUTION

A. The installation shall be performed in full compliance with the approved shop drawings.

B. The installation shall be in accordance with the manufacturer's specifications and recommendations.

C. Striping shall be to NFHS standards, or as shown on plans.

D. All inlaid lines shall be straight and true.

E. Gmax testing shall be completed following the turf installation. Testing shall be done at a minimum of 5 locations on the field. The average Gmax shall be below 110, with an individual maximum of 120. Testing to be paid for by the contractor.

END OF SECTION

SECTION 32 9300
PLANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Plants.
2. Tree Stabilization Materials.

B. Related Requirements:

1. Section 32 1313 "Concrete Paving" for concrete pavement and walks.
2. Section 33 4100 "Storm Utility Drainage Piping" and Section 334600 “Subdrainage” for plaza and planter drainage.

1.3 UNIT PRICES

A. Work of this Section is affected by unit prices specified in Section 01 2200 "Unit Prices."

B. Unit prices apply to authorized work covered by quantity allowances.

C. Unit prices apply to additions to and deletions from the Work as authorized by Change Orders.

1.4 DEFINITIONS

A. Backfill: The earth used to replace or the act of replacing earth in an excavation.

B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with a ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required; wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.

C. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.

D. Fabric Bag-Grown Stock: Healthy, vigorous, well-rooted plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of plant.

E. Finish Grade: Elevation of finished surface of planting soil.

F. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant. Some sources classify herbicides separately from pesticides.

G. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

H. Planting Area: Areas to be planted.

I. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See Section 329113 "Soil Preparation" for drawing designations for planting soils.

J. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.

K. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.

L. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.

M. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

1.5 COORDINATION

Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.

When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

1.6 PREINSTALLATION MEETINGS

Preinstallation Conference: Conduct conference at Project site.

1.7 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Plant Materials: Include quantities, sizes, quality, photographs and sources for plant materials.

2. Plant Photographs: Include color photographs in digital format of each required species and size of plant material as it will be furnished to Project. Take photographs from an angle depicting true size and condition of the typical plant to be furnished. Include a scale rod or other measuring device in each photograph. For species where more than 20 plants are required, include a minimum of three photographs showing the average plant, the best quality plant, and the worst quality plant to be furnished. Identify each photograph with the full scientific name of the plant, plant size, and name of the growing nursery.

B. Samples for Verification: For each of the following:

1. Trees and Shrubs: 12 Samples of each variety and size delivered to site for review. Maintain approved Samples on-site as a standard for comparison.
2. Organic Mulch: 1-pint volume of each organic mulch required; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of color, texture, and organic makeup.
3. Mineral Mulch: 2 lb of each mineral mulch required, in sealed plastic bags labeled with source of mulch. Sample shall be typical of the lot of material to be delivered and installed on-site; provide an accurate indication of color, texture, and makeup of the material.
4. Proprietary Root-Ball-Stabilization Device: One unit.
5. Proprietary Staking and Guying Device: One unit.
6. Slow-Release, Tree-Watering Device: One unit of each size required.
7. Edging Materials and Accessories: Manufacturer's standard size, to verify color selected.
8. Root Barrier: Width of panel by 12 inches.

1.8 INFORMATIONAL SUBMITTALS

A. Qualification Data: For landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.

B. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:

1. Manufacturer's certified analysis of standard products.
2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.

C. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

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SECTION 32 9300
PLANTS

1.9 CLOSEOUT SUBMITTALS

Maintenance Data: Recommended procedures to be established by Owner for maintenance of plants during a calendar year. Submit before expiration of the Landscape Establishment period (as described in Section 214.04 of the CDOT Standard Specifications).

1.10 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of plants.

1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
2. Experience: Three years' experience in landscape installation in addition to requirements in Section 014000 "Quality Requirements."
3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
4. Personnel Certifications: Installer's personnel assigned to the Work shall have certification in one all of the following categories from the Professional Landcare Network:
   a. Landscape Industry Certified Technician - Exterior.
   b. Landscape Industry Certified Interior.
   c. Landscape Industry Certified Horticultural Technician.
5. Pesticide Applicator: State licensed, commercial.

B. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.

Selection of plants purchased under allowances is made by Architect, who tags plants at their place of growth before they are prepared for transplanting.

C. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.

1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container-grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements 6 inches above the root flare for trees up to 4-inch caliper size, and 12 inches above the root flare for larger sizes.
2. Other Plants: Measure with stems, petioles, and foliage in their normal position.

D. Plant Material Observation: Landscape Architect may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Landscape Architect may also observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and may reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.

Notify Landscape Architect of sources of planting materials 14 days in advance of delivery to site.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws if applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk materials with appropriate certificates.

C. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.

D. Handle planting stock by root ball.

E. Store bulbs, corms, and tubers in a dry place at 60 to 65 deg F until planting.

F. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during digging, handling, and transportation.

If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.

G. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.

H. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.

1. Heel-in bare-root stock. Soak roots that are in less than moist condition in water for two hours. Reject plants with dry roots.
2. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.

3. Do not remove container-grown stock from containers before time of planting.
4. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly wet condition.

1.12 FIELD CONDITIONS

A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.

B. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.

1. Spring Planting: April 15 – June 15
2. Fall Planting: September 1 – October 15

C. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

1.13 WARRANTY

A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within the Landscape Establishment period (as described in Section 214.04 of the CDOT Standard Specifications).

1. Failures include, but are not limited to, the following:
   a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner.
   b. Structural failures including plantings falling or blowing over.
   c. Faulty performance of tree stabilization.
   d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
2. Include the following remedial actions as a minimum:
   a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
   b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of the Landscape Establishment period (as described in Section 214.04 of the CDOT Standard Specifications).
   c. A limit of one replacement of each plant is required except for losses or replacements due to failure to comply with requirements.
   d. Provide extended warranty for period equal to original warranty period, for replaced plant material.

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SECTION 32 9300
PLANTS

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant List, Plant Schedule, or Plant Legend indicated on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch in diameter; or with stem girdling roots are unacceptable.
2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.

B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.

C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which begins at root flare according to ANSI Z60.1. Root flare shall be visible before planting.

D. Labeling: Label each plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant.

E. If formal arrangements or consecutive order of plants is indicated on Drawings, select stock for uniform height and spread, and number the labels to assure symmetry in planting.

F. Annuals: Provide healthy, disease-free plants of species and variety shown or listed, with well-established root systems reaching to sides of the container to maintain a firm ball, but not with excessive root growth encircling the container. Provide only plants that are acclimated to outdoor conditions before delivery.

2.2 FERTILIZERS

Planting Tablets: Tightly compressed chip-type, long-lasting, slow-release, commercial-grade planting fertilizer in tablet form. Tablets shall break down with soil bacteria, converting nutrients into a form that can be absorbed by plant roots.

1. Size: 10-gram tablets.

2. Nutrient Composition: 20 percent nitrogen, 10 percent phosphorous, and 5 percent potassium, by weight plus micronutrients.

2.3 MULCHES

A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:

1. Type: Shredded hardwood.
2. Size Range: 3 inches maximum, 1/2 inch minimum.
3. Color: Natural.

B. Mineral Mulch: Hard, durable stone, washed free of loam, sand, clay, and other foreign substances, of the following type, size range, and color:

1. Type: Crushed stone or gravel
2. Size Range: 3/4 inch maximum
3. Color: Uniform tan-beige color range acceptable to Architect

2.4 PESTICIDES

A. General: Pesticide registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

C. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

2.5 TREE-STABILIZATION MATERIALS

A. Trunk-Stabilization Materials:

1. Tree anchors: Galvanized steel anchors connected directly to structure below.
2. Wood Deadmen: Timbers measuring 8 inches in diameter and 48 inches long, treated with specified wood pressure-preservative treatment.
3. Flexible Ties: Wide rubber or elastic bands or straps of length required to reach stakes or turnbuckles.
4. Guys and Tie Wires: ASTM A 641/A 641M, Class 1, galvanized-steel wire, two-strand, twisted, 0.106 inch in diameter.
5. Tree-Tie Webbing: UV-resistant polypropylene or nylon webbing with brass grommets.
6. Guy Cables: Five-strand, 3/16-inch- diameter, galvanized-steel cable, with zinc-coated turnbuckles, a minimum of 3 inches long, with two 3/8-inch galvanized eyebolts.

7. Flags: Standard surveyor's plastic flagging tape, white, 6 inches long.
8. Proprietary Staking-and-Guying Devices: Proprietary stake or anchor and adjustable tie systems to secure each new planting by plant stem; sized as indicated and according to manufacturer's written recommendations.
   a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      1) Arborbrace; ArborBrace Tree Guying System.
      2) Better Bilt Products, Inc; Tree Anchor Kit.
      3) DeepRoot Green Infrastructure, LLC; ArborTie AT LD100 Professional Anchoring Kit.
      4) Foresight Products, LLC; Duckbill Professional Tree Guy System.

B. Root-Ball Stabilization Materials:

1. Proprietary Root-Ball Stabilization Devices: Proprietary at- or below-grade stabilization systems to secure each new planting by root ball and that do not encircle the trunk; sized according to manufacturer's written recommendations unless otherwise indicated. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   1) Border Concepts, Inc; Tomahawk Tree Stabilizers.
   2) Foresight Products, LLC; Duckbill Rootball Fixing System.
   3) Tree Staple, Inc; Tree Staples.

2.6 MISCELLANEOUS PRODUCTS

A. Wood Pressure-Preservative Treatment: AWPA U1, Use Category UC4a; acceptable to authorities having jurisdiction, and containing no arsenic or chromium.

B. Root Barrier: Black, molded, modular panels 18 inches high (deep), 85 mils thick, and with vertical root deflecting ribs protruding 3/4 inch out from panel surface; manufactured with minimum 50 percent recycled polyethylene plastic with UV inhibitors. Root barriers to be used on all over-structure tree planting.

Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. DeepRoot Green Infrastructure, LLC.
   b. NDS Inc.
   c. Villa Root Barrier.

C. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's written instructions.

D. Burlap: Non-synthetic, biodegradable.

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SECTION 32 9300
PLANTS

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive plants, with Installer present, for compliance with requirements and conditions affecting installation and performance of the Work.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
2. Verify that plants and vehicles loaded with plants can travel to planting locations with adequate overhead clearance.
3. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
4. Uniformly moisten excessively dry soil that is not workable or which is dusty.

B. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.

D. Lay out plants at locations directed by Architect. Stake locations of individual trees and shrubs and outline areas for multiple plantings.

3.3 PLANTING AREA ESTABLISHMENT

A. General: Prepare planting area for soil placement and mix planting soil according to Section 329113 "Soil Preparation."

B. Placing Planting Soil: Place manufactured planting soil or growing media over exposed subgrade.

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C. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 EXCAVATION FOR TREES AND SHRUBS (applies only to off-cover planting areas; refer to garden roof assembly specification for over-cover applications)

A. Planting Pits and Trenches: Excavate circular planting pits.

1. Excavate planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are unacceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
2. Excavate approximately three times as wide as ball diameter for balled and burlapped stock.
3. Excavate at least 12 inches wider than root spread and deep enough to accommodate vertical roots for bare-root stock.
4. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
5. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
6. Maintain angles of repose of adjacent materials to ensure stability. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
7. Maintain supervision of excavations during working hours.
8. Keep excavations covered or otherwise protected after working hours.
9. If drain tile is indicated on Drawings or required under planting areas, excavate to top of porous backfill over tile.

B. Backfill Soil: Subsoil and topsoil removed from excavations may not be used as backfill soil unless otherwise indicated.

C. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations

D. Percolation Test Pit:

1. Location: At up to six (6) locations as determined by the Landscape Architect on site.
2. Restrictions: Do not perform test on a rainy day or during freezing weather. Repeat tests interrupted by rain or cold.
3. Procedure:
   a. Dig test pit of a size specified for the tree pits, a minimum of 4 ft. deep, or to match bottom of root ball location. Legibly calibrate a stake at 1 in. intervals and drive it firmly into the undisturbed soil at the bottom of the pit.
   b. Fill test pit with water to within 1 ft. of the finish grade. Immediately record water level on the stake.

c. After 3 hours, record water level again. Repeat recording of water level once each hour for the succeeding five hours.
d. Tree pits that do not drain completely within twenty-four (24) hours shall be provided with a twelve (12)-inch minimum diameter, thirty-six (36)-inch auger holes one (1) per tree pit filled with gravel. Fill pit with 1 ft. of water to confirm the tree pit is properly draining. If the pit does not drain after the gravel is added, contact Landscape Architect.
e. For tree pits that do not drain and require gravel, each adjacent tree pit should also be tested to insure proper drainage.

4. Documentation: Submit written documentation of test pit results, dated and signed by the tester.

3.5 TREE, SHRUB, PERENNIAL AND BULB PLANTING

A. Inspection: At time of planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.

B. Roots: Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.

C. Balled and Burlapped Stock: Set each plant plumb and in center of planting pit or trench with root flare 1 inch above adjacent finish grades.

1. Backfill: Planting soil. For trees, use excavated soil for backfill.
2. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
4. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside the root ball about 1 inch from root tips; do not place tablets in bottom of the hole.
   Quantity: Two per plant.
5. Continue backfilling process. Water again after placing and tamping final layer of soil.

D. Balled and Potted and Container-Grown Stock: Set each plant plumb and in center of planting pit or trench with root flare 1 inch above adjacent finish grades.

1. Backfill: Planting soil. For trees, use excavated soil for backfill.
2. Carefully remove root ball from container without damaging root ball or plant.
3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.

4. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside the root ball about 1 inch from root tips; do not place tablets in bottom of the hole.
   Quantity: As indicated on Drawings.
5. Continue backfilling process. Water again after placing and tamping final layer of soil.

E. Slopes: When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

3.6 TREE, SHRUB, PERENNIAL AND BULB PERENNIAL PRUNING

A. Remove only dead, dying, or broken branches. Do not prune for shape.

B. Prune, thin, and shape trees, shrubs, and vines as directed by City Forester.

C. Prune, thin, and shape trees, shrubs, and vines according to standard professional horticultural and arboricultural practices. Unless otherwise indicated by Architect, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.

D. Do not apply pruning paint to wounds.

3.7 TREE STABILIZATION

A. Trunk Stabilization by Upright Staking and Tying: Install trunk stabilization as follows unless otherwise indicated:

1. Upright Staking and Tying: Stake trees of 2- through 5-inch caliper. Stake trees of less than 2-inch caliper only as required to prevent wind tip out. Use a minimum of two stakes of length required to penetrate at least 18 inches below bottom of backfilled excavation and to extend to the dimension indicated on Drawings above grade. Set vertical stakes and space to avoid penetrating root balls or root masses.
2. Upright Staking and Tying: Stake trees with two stakes for trees up to 12 feet high and 2-1/2 inches or less in caliper; three stakes for trees less than 14 feet high and up to 4 inches in caliper. Space stakes equally around trees.
3. Support trees with bands of flexible ties at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.
4. Support trees with two strands of tie wire, connected to the brass grommets of tree-tie webbing at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.

B. Trunk Stabilization by Staking and Guying: Install trunk stabilization as follows unless otherwise indicated on Drawings. Stake and guy trees more than 14 feet in height and more than 3 inches in caliper unless otherwise indicated.

1. Site-Fabricated, Staking-and-Guying Method: Install no fewer than three guys spaced equally around tree.
   a. Securely attach guys to stakes 30 inches long, driven to grade. Adjust spacing to avoid penetrating root balls or root masses. Provide turnbuckle for each guy wire and tighten securely.
   b. Support trees with bands of flexible ties at contact points with tree trunk and reaching to turnbuckle. Allow enough slack to avoid rigid restraint of tree.
   c. Support trees with guy cable, connected to the brass grommets of tree-tie webbing at contact points with tree trunk and reaching to turnbuckle. Allow enough slack to avoid rigid restraint of tree.
   d. Attach flags to each guy wire, 30 inches above finish grade.
   e. Paint turnbuckles with luminescent white paint.
2. Proprietary Staking and Guying Device: Install staking and guying system sized and positioned as recommended by manufacturer unless otherwise indicated and according to manufacturer's written instructions.

C. Root-Ball Stabilization: Install at- or below-grade stabilization system to secure each new planting by the root ball unless otherwise indicated.

1. Wood Hold-Down Method: Place vertical stakes against side of root ball and drive them into subsoil; place horizontal wood hold-down stake across top of root ball and screw at each end to one of the vertical stakes.
   a. Install stakes of length required to penetrate at least to the dimension indicated on Drawings below bottom of backfilled excavation. Saw stakes off at horizontal stake.
   b. Install screws through horizontal hold-down and penetrating at least 1 inch into stakes. Predrill holes if necessary to prevent splitting wood.
   c. Install second set of stakes on other side of root trunk for larger trees.
2. Proprietary Root-Ball Stabilization Device: Install root-ball stabilization system sized and positioned as recommended by manufacturer unless otherwise indicated and according to manufacturer's written instructions.

3.8 ROOT-BARRIER INSTALLATION

A. Install root barrier where trees are planted within 48 inches of paving or other hardscape elements, such as walls, curbs, and walkways, unless otherwise indicated on Drawings.

B. Align root barrier vertically and horizontally within permanent planters over structure, and run it linearly along and adjacent to the paving or other hardscape elements to be protected from invasive roots.

C. Install root barrier continuously for a distance of 60 inches in each direction from the tree trunk, for a total distance of 10 feet per tree. If trees are spaced closer, use a single continuous piece of root barrier.

1. Position top of root barrier according to manufacturer's written recommendations.
2. Overlap root barrier a minimum of 12 inches at joints.

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3. Do not distort or bend root barrier during construction activities.
4. Do not install root barrier surrounding the root ball of tree.

3.9 PLACING SOIL IN PLANTERS

A. Place a layer of drainage gravel at least 4 inches thick in bottom of planter. Cover bottom with filter fabric and wrap filter fabric 4 inches up on all sides. Duct tape along the entire top edge of the filter fabric, to secure the filter fabric against the sides during the soil-filling process.

B. Fill planter with planting soil. Place soil in lightly compacted layers to an elevation of 1-1/2 inches below top of planter, allowing natural settlement.

3.10 GROUND COVER AND PLANT PLANTING

A. Set out and space ground cover and plants other than trees, shrubs, and vines as indicated on Drawings in even rows with triangular spacing.

B. Use planting soil for backfill.

C. Dig holes large enough to allow spreading of roots.

D. For rooted cutting plants supplied in flats, plant each in a manner that minimally disturbs the root system but to a depth not less than two nodes.

E. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.

F. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

G. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.11 PLANTING AREA MULCHING

Mulch backfilled surfaces of planting areas and other areas indicated.

1. Trees in Turf Areas: Apply organic mulch ring of 3-inch average thickness. Do not place mulch within 3 inches of trunks or stems.
2. Organic Mulch in Planting Areas: Apply 3-inch average thickness of organic mulch over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 3 inches of trunks or stems.
3. Mineral Mulch in Planting Areas: Apply 3-inch average thickness of mineral mulch over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 3 inches of trunks or stems.

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3.12 PLANT MAINTENANCE DURING THE LANDSCAPE ESTABLISHMENT PERIOD

A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings.

B. Fill in, as necessary, soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.

C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices when possible to minimize use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

3.13 PESTICIDE APPLICATION DURING THE LANDSCAPE ESTABLISHMENT PERIOD

A. Apply pesticides and other chemical products and biological control agents according to authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

B. Pre-Emergent Herbicides (Selective and Nonselective): Apply to tree, shrub, and ground-cover areas according to manufacturer's written recommendations. Do not apply to seeded areas.

C. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

3.14 REPAIR AND REPLACEMENT

A. General: Repair or replace existing or new trees and other plants that are damaged by construction operations, in a manner approved by Architect.

1. Submit details of proposed pruning and repairs.
2. Perform repairs of damaged trunks, branches, and roots within 24 hours, if approved.
3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Architect.

B. Remove and replace trees that are more than 25 percent dead or in an unhealthy condition before the end of the Landscape Establishment period (as described in Section 214.04 of the CDOT Standard Specifications) or are damaged during construction operations that Architect determines are incapable of restoring to normal growth pattern.

1. Provide new trees of same size as those being replaced for each tree of 4 inches in caliper size.
2. Species of Replacement Trees: Species selected by Architect.

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3.15 CLEANING AND PROTECTION

A. During planting, keep adjacent paving and construction clean and work area in an orderly condition. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

C. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.

D. After installation and before Substantial Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

E. At time of Substantial Completion, verify that tree-watering devices are in good working order and leave them in place. Replace improperly functioning devices.

3.16 MAINTENANCE SERVICE DURING LANDSCAPE ESTABLISHMENT PERIOD

A. Maintenance Service for Trees and Shrubs: Provide maintenance by skilled employees of landscape Installer. Maintain as required in "Plant Maintenance" Article. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established, but for not less than maintenance period below:

B. Maintenance Service for Ground Cover and Other Plants: Provide maintenance by skilled employees of landscape Installer. Maintain as required in "Plant Maintenance" Article. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established, but for not less than maintenance period below:

END OF SECTION

Schedule 10A
Applicable Standards And Specifications

1. APPLICABLE STANDARDS AND SPECIFICATIONS

a. Subject to Section 8.6 of the Project Agreement, the Developer shall comply with all Construction Standards, including (but, for certainty, not limited to) those listed in this Schedule 10A.

b. The standards are listed in this Schedule 10A by technical discipline for convenience only and, accordingly, such listing shall not be interpreted as limiting the application of such standards only to the specified technical disciplines if they are also applicable to other technical disciplines.

Availability Legend

NS = Document not supplied with RFP

S = Document supplied with RFP

Table 1 General Standards and Specifications

Doc #	Document	Availability
8	**Project Administration**	
10A.8.01	29 CFR 1910, Federal Occupational Safety and Health Standards (General Industry)	NS
10A.8.02	CDOT Project Development Manual	NS
10A.8.03	CDOT Revisions to Project Development Manual	NS
10A.8.04	CDOT Workplace Safety Manual	NS
10A.8.05	FPA 101 Line Safety Code	NS
10A.8.06	International Organization for Standardization	NS
10A.8.07	National Institute of Standards and Technology	NS
10A.8.08	OSHA Standard Specifications	NS
10.2	**Maintenance of Traffic**	
10A.10.2.01	ATSSA Quality Guidelines for Work Zone Traffic Control Devices	NS
10A.10.2.02	CCD Construction Detour Standards for Multi-use Trails	NS
10A.10.2.03	CDOT Guidelines for Developing Traffic Incident Management Plans for Work Zones	NS
10A.10.2.04	CDOT Region 1 Lane Closure Strategy	NS
10A.10.2.05	CDOT Safety Guide	NS
10A.10.2.06	CDOT Work Zone Safety and Mobility Rule Procedures Document	NS
10A.10.2.07	CDOT Work Zone Safety Booklet	NS
10A.10.2.08	The Roadway Safety Consortium Guidelines on Work Zone Access and Egress	NS

Doc #	Document	Availability
10.3	**ITS and Tolling Equipment**	
10A.10.3.01	AASHTO Guide for High-Occupancy Vehicle Facilities	NS
10A.10.3.02	AI/EIA/TA 568 A	NS
10A.10.3.03	ANSI/SCTE 77 Specifications for Underground Enclosure Integrity	NS
10A.10.3.04	CDOT ITS Standard Details	NS
10A.10.3.05	Electronic Industries Alliance	NS
10A.10.3.06	Institute of Electrical and Electronics Engineers	NS
10A.10.3.07	Insulated Cable Engineers Association	NS
10A.10.3.08	International Electrotechnical Commission	NS
10A.10.3.09	International Telecommunications Union	NS
10A.10.3.10	National Electrical Manufacturing Association Standards and Specifications	NS
10A.10.3.11	IEEE-C2 National Electric Safety Code	NS
10A.10.3.12	NFPA 70 National Electric Code	NS
10A.10.3.13	Rural Utilities Service	NS
10A.10.3.14	Telcordia Technologies	NS
10A.10.3.15	Telecommunications Industry Association	NS
10A.10.3.16	Zayo OSP Manual	S
10.4	**Utilities**	
10A.10.4.01	CCD Operating Rules of the Board of Water Commissioners	NS
10A.10.4.02	CCD Rules & Regulations for Governing Sewerage Charges and Fees and Management of Wastewater	NS
10A.10.4.03	CCD Sanitary Sewer Master Plan	NS
10A.10.4.04	CCD Sanitary Sewer Design Technical Criteria Manual	NS
10A.10.4.05	CCD Wastewater Standard Details	NS
10A.10.4.06	CDOT Utility Accommodation Code	NS
10A.10.4.07	CCD Utility Plan Review	NS
10A.10.4.08	Denver Water Engineering Standards including Materials Specifications and Standard Drawings	NS
10A.10.4.09	Denver Water Capital Projects Construction Standards Volumes I, II, and III	NS
10A.10.4.10	Denver Water Plan Review Guidelines	NS

Doc #	Document	Availability
10A.10.4.11	Wastewater Capital Projects Management Standard Construction Specifications	NS
10A.10.4.12	Wastewater Standard Detail Drawings	NS
10A.10.4.13	Metro Wastewater Reclamation District Rules and Regulations	NS
10A.10.4.14	Metro Engineering Standards	NS
10.5	**Survey**	
10A.10.5.01	CCD Address Assignment Card Entrance Requirements	NS
10A.10.5.02	CCD Easement Relinquishment Entrance Requirements	NS
10A.10.5.03	CCD Guidelines and Requirements for Range Points	NS
10A.10.5.04	CCD Guidelines for Survey Control for Design of City Project	NS
10A.10.5.05	CDOT Survey Manual	NS
10.6	**Roadway Pavements**	
10A.10.6.01	CCD Approved Concrete Mix Designs	S
10A.10.6.02	CCD Approved List of HMAP Asphalt Mix Designs	S
10A.10.6.03	CDOT Field Materials Manual	NS
10A.10.6.04	CDOT Laboratory Manual of Test Procedures	NS
10A.10.6.05	CDOT M-E Pavement Design Manual	NS
10A.10.6.06	CDOT Pavement Design Manual	NS
10A.10.6.07	CDOT Field Studies Guidelines	NS
10A.10.6.08	Metropolitan Government Pavement Engineers Council Pavement Design Standards and Construction Specifications	NS
10.8	**Drainage**	
10A.10.8.01	CCD Construction Activities Stormwater Discharge Permit	NS
10A.10.8.02	CCD Construction Activities Stormwater Manual	NS
10A.10.8.03	CCD Storm Drainage Design & Technical Criteria	NS
10A.10.8.04	CCD Storm Drainage Master Plan	NS
10A.10.8.05	CCD Underground Water Quality Devices	NS
10A.10.8.06	CDOT Detour Drainage Structure Design Procedure	NS
10A.10.8.07	CDOT Drainage Design Manual	NS
10A.10.8.08	CDOT Erosion Control & Stormwater Quality Guide	NS

Doc #	Document	Availability
10A.10.8.09	CDOT SWMP Template for Project with 1 Acre or More of Disturbance	NS
10A.10.8.10	CDOT Municipal Separate Storm Sewer (MS4) NPDES Permit	NS
10A.10.8.11	CDOT New Development & Redevelopment Interim Program Guidance as of 3/10/2015	S
10A.10.8.12	CDOT Pipe Material Selection Policy Guide	NS
10A.10.8.13	FEMA Applicable guidelines for LOMR/CLOMR	NS
10A.10.8.14	FEMA Flood Insurance Rate Map	NS
10A.10.8.15	FEMA Flood insurance Study, City and County of Denver, Colorado Volume 1 and 2 (080046V001B)	NS
10A.10.8.16	FHWA HDS No. 5, Hydraulic Design of Highway Culverts	NS
10A.10.8.17	FHWA HEC-11, Design of Riprap Revetment	NS
10A.10.8.18	FHWA HEC-12-Drainage of Highway Pavements	NS
10A.10.8.19	FHWA HEC-13, Hydraulic Design of Improved Inlets for Culverts	NS
10A.10.8.20	FHWA HEC-14, Hydraulic Design of Energy Dissipaters for Culverts and Channels	NS
10A.10.8.21	FHWA HEC-15, Design of Roadside Channels with Flexible Linings	NS
10A.10.8.22	FHWA HEC-18, Evaluating Scour at Bridges	NS
10A.10.8.23	FHWA HEC-20, Stream Stability at Highway Structures	NS
10A.10.8.24	FHWA HEC-21, Design of Bridge Deck Drainage	NS
10A.10.8.25	FHWA HEC-22, Urban Drainage Design Manual	NS
10A.10.8.26	FHWA HEC-23, Bridge Scour and Stream Instability Countermeasures Experience, Selection, and Design Guidance Volume 1 & Volume 2	NS
10A.10.8.27	FHWA HEC-24, Highway Stormwater Pump Station Design	NS
10A.10.8.28	UDFCD Design of Low Tailwater Riprap Basins for Storm Sewer Pipe Outlets	NS
10A.10.8.29	UDFCD Urban Storm Drainage Criteria Manual	NS
10A.10.8.30	UDFCD Flood Hazard Area Delineation	NS
10A.10.8.31	UDFCD Major Drainageway Planning Studies	NS
10A.10.8.32	UDFCD Outfall System Planning Studies	NS
10.9	**Roadway**	
10A.10.9.01	AASHTO A Policy on Design Standards Interstate System	NS
10A.10.9.02	AASHTO A Policy on Geometric Design of Highways and Streets	NS

Doc #	Document	Availability
10A.10.9.03	AASHTO Guide for Development of New Bicycle Facilities	NS
10A.10.9.04	AASHTO Roadside Design Guide	NS
10A.10.9.05	AASHTO Standard Specifications	NS
10A.10.9.06	ADA Accessibility Guidelines	NS
10A.10.9.07	ADA Standards for Accessible Design	NS
10A.10.9.08	ADA Standards for Transportation Facilities	NS
10A.10.9.09	ADA Accessibility Guidelines for Buildings and Facilities	NS
10A.10.9.10	CCD Rules & Regulations for Criteria for Hazardous or Defective Sidewalks	NS
10A.10.9.11	CCD Rules & Regulations for Encroachments in the Public Right of Way	NS
10A.10.9.12	CCD Rules & Regulations for Governing Street Cuts and Roadway Excavation Specifications	NS
10A.10.9.13	CCD Rules & Regulations for Sidewalk and Curb Ramp Construction	NS
10A.10.9.14	CCD Rules & Regulations for Standard Right-of-Way Cross Sections and Utility Locations	NS
10A.10.9.15	CCD Rules & Regulations for the Construction of Curbs, Gutters, Sidewalks, Driveways, Street Paving, and other Public Right-of-Way Improvements	NS
10A.10.9.16	CCD Rules & Regulations Pertaining to the Issuance of Permits by the City Traffic Engineer	NS
10A.10.9.17	CCD Transportation Standards and Details for Engineering Division	NS
10A.10.9.18	CCD Transportation Engineering Plan Review Submittal Requirements	NS
10A.10.9.19	CCD Streetscape Design Manual	NS
10A.10.9.20	CCD Amendments to the Building Code for the City and County of Denver	NS
10A.10.9.21	CCD Capital Project Engineering Plans (CPEP) Review Submittal Checklist	NS
10A.10.9.22	CCD Construction Detour Standards for Bikeways and Multi-Use Trails	S
10A.10.9.23	CCD Ultra-Urban Green Infrastructure Guidelines	NS
10A.10.9.24	CDOT CADD Manual	NS
10A.10.9.25	CDOT Construction Manual	NS
10A.10.9.26	CDOT Drafting Standards	NS
10A.10.9.27	CDOT Roadway Design Guide	NS
10A.10.9.28	CDOT Standard Plans, M & S Standards	NS
10A.10.9.29	CDOT Standard Specifications for Road and Bridge Construction	NS

Doc #	Document	Availability
10A.10.9.30	CDOT Urban Design Manual	NS
10A.10.9.31	CDOT State Highway Access Code	NS
10A.10.9.32	NACTO Urban Street Design Guide	NS
10.10	**Railroads**	
10A.10.10.01	BNSF Railway – UPRR Guidelines for Railroad Grade Separation Projects	NS
10A.10.10.02	UPRR Guidelines for Preparation of Bridge Demolition and Removal Plan for Structures over Railroad	NS
10.11	**Signing, Pavement Markings, Signalization, and Lighting**	
10A.10.11.01	AI RP-8-00 Illumination Engineering Society of North America	NS
10A.10.11.02	CCD Traffic Signal and Sign & Markings Standards	NS
10A.10.11.03	CCD Street Lighting/Pedestrian Lighting, Design and Review Guidelines	NS
10A.10.11.04	CCD All-Dialectric Loose Tube Fiber Optic Cable	S
10A.10.11.05	CDOT Guide Sign Policy Manual	NS
10A.10.11.06	CDOT Lighting Design Guide	NS
10A.10.11.07	CDOT Retroreflective Sheeting Materials Guide	NS
10A.10.11.08	CDOT Sign Design Manual	NS
10A.10.11.09	CDOT Supplement to Standard Highway Signs	NS
10A.10.11.10	FHWA Manual on Uniform Traffic Control Devices	NS
10A.10.11.11	FHWA Standard Sign	NS
10A.10.11.12	Transportation Research Board Highway Capacity Manual	NS
10A.10.11.13	Xcel Energy Outdoor Lighting Manual	S
10A.10.11.14	AREMA Communications & Signals Manual	NS
10A.10.11.15	CDOT The Colorado Supplement to the Federal Manual on Uniform Traffic Control Devices	NS
10.12	**Cover MEP System**	
10A.10.12.01	AMCA 250, Laboratory Methods of Testing Jet Tunnel Fans for Performance	NS
10A.10.12.02	AMCA 300 Reverberant Room Method for Sound Testing	NS
10A.10.12.03	ANSI/IESNA RP-22-11 Tunnel Lighting	NS
10A.10.12.04	ANSI/UL 2196 Tests for Fire Resistive Cables	NS

Doc #	Document	Availability
10A.10.12.05	ASHRAE LV-11-C076: Impact of Tunnel Ventilation on Tunnel Fixed Fire Suppression System.	NS
10A.10.12.06	ASHRAE LV-11-C077: Advanced Analysis Techniques in the Design of Longitudinal Tunnel Ventilation System Using Jet Fans	NS
10A.10.12.07	ASHRAE LV-11-C078: Assessing the Impact Fire Heat Release Rate has on Infrastructure Design and Constructability of Rail and Road Tunnels Ventilation Systems	NS
10A.10.12.08	ASHRAE OR-05-15-3: Investigation of Effectiveness of Emergency Ventilation Strategies in the Event of Fires in Road Tunnels	NS
10A.10.12.09	ASHRAE standards	NS
10A.10.12.10	ASTM E 119, Standard test Methods for Fire Tests of Building Construction and Materials	NS
10A.10.12.11	ASTM E 136, Standard test method for behavior of materials in a vertical tube furnace at 750°C	NS
10A.10.12.12	ASTM E 2652 Standard test method for behavior of materials in a tube furnace with a cone-shaped airflow stabilizer at 750°C	NS
10A.10.12.13	CIE 088 Guide for the Lighting of Road Tunnels and Underpasses	NS
10A.10.12.14	CIE 88. Guide for the Lighting of Road Tunnels and Underpasses.	NS
10A.10.12.15	Engineering Guidance for Water Based Fire Fighting Systems for a comprehensive evaluation of tunnels with fixed firefighting systems, scientific report of the SOLIT research project, prepared by the SOLIT consortium	NS
10A.10.12.16	Engineering Guidance for Water Based Fire Fighting Systems for a comprehensive evaluation of tunnels with fixed firefighting systems, Scientific report of the SOLIT research project, prepared by the SOLIT consortium	NS
10A.10.12.17	FHWA Road Tunnel Design Guidelines	NS
10A.10.12.18	FHWA Systems Engineering Guidebook for Intelligent Transportation Systems	NS
10A.10.12.19	FT4/IEEE 1202 Standard for Flame Propagation Testing of Wire and Cable	NS
10A.10.12.20	IEC 61508 Functional safety of electrical/electronic/programmable electronic safety-related systems	NS
10A.10.12.21	IEC61508 Functional safety of electrical/electronic/ programmable electronic safety – related systems	NS
10A.10.12.22	IESNA LM 79 Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products	NS
10A.10.12.23	IESNA LM 80 Approved Method: Measuring Lumen Maintenance of LED Light Sources + Addendum A	NS
10A.10.12.24	IESNA TM-21 Projecting Long Term Maintenance of LED Light Sources	NS
10A.10.12.25	ISO 1182 Reaction to fire tests for building and transport products - Non-combustibility tests	NS
10A.10.12.26	ISO/IEC 27001 Information technology -- Security techniques -- Information security management systems – Requirements	NS
10A.10.12.27	ISO/TR 13387 Part 1 Fire Safety Engineering. Application of fire performance concepts to design objectives	NS
10A.10.12.28	ISO/TR 13387 Part 2 Fire Safety Engineering. Design Fire Scenarios and Design Fires	NS

Doc #	Document	Availability
10A.10.12.29	ISO/TR 13387 Part 3 Fire Safety Engineering	NS
10A.10.12.30	ISO/TR 13387 Part 3 Fire Safety Engineering. Assessment and Verification of mathematical fire models	NS
10A.10.12.31	ISO/TR 13387 Part 4 Fire Safety Engineering. Initiation and development of fire and generation of fire effluents	NS
10A.10.12.32	ISO/TR 13387 Part 5 Fire Safety Engineering. Movement of fire effluents	NS
10A.10.12.33	ISO/TR 13387 Part 6 Fire Safety Engineering. Structural Response and fire spread beyond the enclosure of origin	NS
10A.10.12.34	ISO/TR 13387 Part 7 Fire Safety Engineering. Detection, Activation and Suppression	NS
10A.10.12.35	ISO/TR 13387 Part 8 Fire Safety Engineering. Life safety- occupant behavior, location and condition	NS
10A.10.12.36	MIL-C-24643 General Specification for Cable and Cords, Electrical, Low Smoke, for Shipboard Use	NS
10A.10.12.37	NFPA 1 Fire Code	NS
10A.10.12.38	NFPA 10 Standard for Portable Fire Extinguishers	NS
10A.10.12.39	NFPA 13 Standard for the installation of Sprinkler Systems	NS
10A.10.12.40	NFPA 14 Standard for the installation of standpipe and hose systems	NS
10A.10.12.41	NFPA 15 Standard for Water Spray Fixed Systems for Fire Protection	NS
10A.10.12.42	NFPA 18 Standard on Wetting Agents	NS
10A.10.12.43	NFPA 20 Standard for the installation of stationary pumps for fire protection	NS
10A.10.12.44	NFPA 22 Standard for Water Tanks for private Fire protection	NS
10A.10.12.45	NFPA 24 Standard for the installation of private fire service mains and the appurtenances	NS
10A.10.12.46	NFPA 25 Standard for Inspection, Testing, and Maintenance of Water-Based Fire protection Systems	NS
10A.10.12.47	NFPA 72 National Fire Alarm and Signaling Code	NS
10A.10.12.48	NFPA 80 Standard for Fire Doors and Other Opening Protectives	NS
10A.10.12.49	NFPA 92 Standard for Smoke Control Systems	NS
10A.10.12.50	NFPA 101 Life Safety Code	NS
10A.10.12.51	NFPA 110 Standard for Emergency and Standby Power Systems	NS
10A.10.12.52	NFPA 111 Standard on Stored Electrical Energy Emergency and Standby Power Systems	NS
10A.10.12.53	NFPA 241 Standard for Safeguarding Construction, Alteration, and Demolition Operations	NS
10A.10.12.54	NFPA 262 Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces	NS
10A.10.12.55	NFPA 502 Standard for Roads, Tunnels, Bridges, and Other Limited Access Highways	NS

Doc #	Document	Availability
10A.10.12.56	NFPA 750 Standard on Water Mist Fire Protection Systems	NS
10A.10.12.57	NFPA 820 Standard for Fire Protection in Wastewater Treatment and Collection Facilities	NS
10A.10.12.58	NFPA 1561 Standard on Emergency Services Incident Management	NS
10A.10.12.59	NFPA 1963 Standard for fire hose connections	NS
10A.10.12.60	PIARC 2008 R07. Road Tunnels: An Assessment of fixed firefighting systems and any such update, replacements or revisions published in the period before the completion of the design	NS
10A.10.12.61	PIARC 2008 R07. Road Tunnels: An Assessment of fixed firefighting systems (or any update, revision or replacement document published)	NS
10A.10.12.62	UL Subject 1724 Outline of Investigation for Fire Tests for Electrical Circuit Protective Systems	NS
10.13	**Structures**	
10A.10.13.01	AASHTO Guide Design Specifications for Bridge Temporary Works	NS
10A.10.13.02	AASHTO Guide Specifications for Design and Construction of Segmental Concrete Bridges	NS
10A.10.13.03	AASHTO Interim Mechanistic Empirical Pavement Design Guide Manual of Practice	NS
10A.10.13.04	AASHTO LRFD Bridge Construction Specifications	NS
10A.10.13.05	AASHTO LRFD Bridge Design Specifications	NS
10A.10.13.06	AASHTO LRFD Guide Specifications for the Design of Pedestrian Bridges	NS
10A.10.13.07	AASHTO Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals	NS
10A.10.13.08	AASHTO Manual for Bridge Evaluation	NS
10A.10.13.09	AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries, and Traffic Signals	NS
10A.10.13.10	AASHTO Standard Specifications for Transportation Materials and Methods of Sampling and Testing	NS
10A.10.13.11	AASHTO Steel Bridge Fabrication Guide Specification	NS
10A.10.13.12	AASHTO Technical Manual for Design and Construction of Road Tunnels – Civil Elements	NS
10A.10.13.13	AASHTO/AWS D1.5 M/D 1.5, Bridge Welding Code	NS
10A.10.13.14	AASHTO/NSBA Shop Detail Drawing Review/Approval Guidelines	NS
10A.10.13.15	AREMA Manual for Railway Engineering	NS
10A.10.13.16	ASTM American Society for Testing and Materials	NS
10A.10.13.17	ASTM D-1143	NS
10A.10.13.18	ASTM D-3966	NS
10A.10.13.19	ASTM Standard Specification Manual	NS

Doc #	Document	Availability
10A.10.13.20	CDOT Bridge Design Manual	NS
10A.10.13.21	CDOT Bridge Detail Manual	NS
10A.10.13.22	CDOT Staff Bridge Fabrication Inspection Manual	NS
10A.10.13.23	CDOT Bridge Rating Manual	NS
10A.10.13.24	CDOT Bridge Technical Memorandums	NS
10A.10.13.25	CDOT Structural Worksheets	NS
10A.10.13.26	FHWA DP-90-068, Permanent Ground Anchors, Volume 1, Final Report	NS
10A.10.13.27	FHWA HI-95-038 Geosynthetic Design and Construction Guidelines	NS
10A.10.13.28	FHWA IF-99-015 Geotechnical Engineering Circular No. 4 – Ground Anchors and Anchored Systems	NS
10A.10.13.29	FHWA NHI-09-087 Corrosion/Degradation of Soil Reinforcements for Mechanically Stabilized Earth Walls and Reinforced Soil Slopes	NS
10A.10.13.30	FHWA NHI-14-067 Geotechnical Engineering Circular No. 7 – Soil Nail Walls	NS
10A.10.13.31	FHWA NHI-10-024 and Design and Construction of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes, Volume I	NS
10A.10.13.32	FHWA NHI-10-025 and Design and Construction of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes, Volume II	NS
10A.10.13.33	FHWA RD-73-93, Analysis and Design Problems in Modeling Slurry Wall Construction	NS
10A.10.13.34	FHWA RD-80-047, Slurry Walls as an Integral Part of Underground Transportation Structures	NS
10A.10.13.35	FHWA RD-82-046, Tiebacks, Executive Summary	NS
10A.10.13.36	FHWA RD-82-047, Tiebacks	NS
10A.10.13.37	FHWA RD-89-93, Soil Nailing for Stabilization of Highway Slopes and Excavations	NS
10A.10.13.38	FHWA NHI-10-016 Drilled Shafts: Construction Procedures and LRFD Design Methods	NS
10A.10.13.39	FHWA SA-00-043, Mechanically Stabilized Earth Walls and Reinforced Soil Slopes Design and Construction Guidelines	NS
10A.10.13.40	FHWA SA-93-068, Soil Nail Field Inspectors Manual – Soil Nail Walls	NS
10A.10.13.41	FHWA NHI-14-007 Soil Nail Walls Reference Manual	NS
10A.10.13.42	International Building Code	NS
10A.10.13.43	NCHRP Report 402, Fatigue Design of Modular Bridge Expansion Joints, Appendix A & Appendix B	NS
10A.10.13.44	NCHRP Report 483: Bridge Life-Cycle Cost Analysis	NS
10A.10.13.45	National Bridge Inspection Standards (NBIS) of the Code of Federal Regulations, 23 Highways – Part 650	NS

Doc #	Document	Availability
10.14	**Landscaping and Aesthetics**	
10A.10.14.01	CCD Denver Parks + Recreation Planning, Design + Construction Standards	NS
10A.10.14.02	Approved Street Tree List for Denver's Public Rights-of-way	NS
10A.10.14.03	CDOT Landscape Architecture Manual	NS
10A.10.14.04	Denver Public Schools Design and Construction Standards	NS
10A.10.14.05	AI Z60.1, American Standards for Nursery Stock	NS
10A.10.14.06	Denver Public Schools Education Specifications	NS
14	**Strategic Communications**	
10A.14.01	CDOT The Colorado Brand Guidelines	NS
17	**Environmental Requirements**	
10A.17.01	CDOT Functional Assessment of Colorado Wetlands (FACWet) methodology	NS
10A.17.02	CDOT Wetland Program Book	NS
10A.17.03	CDOT Checklist for Wetland Finding and Wetland Finding Amendments	NS
10A.17.04	CDOT Noise Analysis and Abatement Guidelines	NS
10A.17.05	CDOT Traffic Noise Model User's Guide for Colorado DOT Projects	NS
10A.17.06	CDOT Noise Program Book	NS
10A.17.07	CDOT Impacted Black-Tailed Prairie Dog Policy	NS
10A.17.08	CDOT Environmental Stewardship Guide	NS
10A.17.09	CDOT NEPA Manual	NS
10A.17.10	CDOT Reevaluation Form No. 1399	NS
10A.17.11	CDOT Guidelines for Senate Bill 40 Wildlife Certification	NS
10A.17.12	CDOT Guidance for Filling Out CDOT Form 1399	NS
10A.17.13	CDOT Air Quality Monitoring Plan Template	NS
10A.17.14	CDOT Air Quality Monitoring, Maintenance, and Mitigation Template	NS
10A.17.15	CDOT Procedures for Hazardous Material Spills that Occur on State and Federal Highways Within Colorado as a Result of a Highway Transportation Incident	NS
10A.17.16	Colorado Weed Management Guide	NS
10A.17.17	Approved Street Tree List for Denver's Public Rights-of-way	NS

Doc #	Document	Availability
10A.17.18	FHWA Highway Construction Noise Handbook	NS
10A.17.19	FHWA Highway Traffic Noise: Analysis and Abatement Guidance	NS
10A.17.20	National Arbor Association Ref. 1. Pruning Standards for Shade Trees	NS
10A.17.21	USACE Wetland Delineation Manual	NS
18	**Right-of-Way**	
10A.18.01	23 CFR 645 Utilities & 23 CFR 646 Railroads	NS
10A.18.02	23 CFR 710.313	NS
10A.18.03	23 CFR 711 & 23 CFR 774	NS
10A.18.04	CDOT Right of Way Manual	NS
10A.18.05	CFR sec. 650.101 through 650.209, Code of Federal Regulations	NS
10A.18.06	CRS 24-56-101, The Colorado Relocation Assistance and Land Acquisition Policy, et seq. as supplemented	NS
10A.18.07	Federal Register, Proposed Rules, December 21, 1992	NS
10A.18.08	The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended	NS
10A.18.09	United States Access Board, Revised Draft Guidelines for Accessible Public Rights-of-Way	NS

2. APPENDICES

Appendix A Modifications to CDOT Standard Specifications

Appendix A
Modifications to CDOT Standard Specifications

1. General

1.1 This Appendix sets forth modifications to the CDOT *Standard Specifications for Road and Bridge Construction* ("CDOT Standard Specifications"), the Standard Special Provisions applicable to the Project and the Project Special Provisions. For certainty, the CDOT Standard Specifications, the Standard Special Provisions and the Project Special Provisions (each, as so modified) are Construction Standards for the purposes of the definition thereof in Part A of Annex A (*Definitions and Abbreviations*) to the Project Agreement. The provisions of Sections 1.2 to 1.11 of this Appendix shall also apply to:

a. the Standard Special Provisions, as if the references to "the CDOT Standard Specifications" in such Sections were references to "the Standard Special Provisions"; and

b. the Project Special Provisions, as if the references to "the CDOT Standard Specifications (as incorporated into the Project Agreement by the terms of this Appendix)" in such Sections were references to "the Project Special Provisions".

1.2 All references to "the Contractor" and "the Contract" in the CDOT Standard Specifications (as incorporated into the Project Agreement by the terms of this Appendix) shall be deemed to be references to "the Developer" and "this Agreement", respectively.

1.3 Subject to Sections 1.4, 1.5, 1.6, 1.8 and 1.9 of this Appendix, all references to "Engineer" in the CDOT Standard Specifications (as incorporated into the Project Agreement by the terms of this Appendix) shall be deemed to be references to the Developer, unless the context requires or the Department determines otherwise.

1.4 When the CDOT Standard Specifications (as incorporated into the Project Agreement by the terms of this Appendix) describe actions, materials, means or methods that are required and that are qualified by phrases such as: "as directed by the Engineer", "when directed by the Engineer", "as determined by the Engineer", "with or without permission of the Engineer", "in the opinion of the Engineer", "unless authorized by the Engineer", "satisfactory to the Engineer", "as approved by the Engineer", or "unless another type is specified or is permitted with approval of the Engineer", such phrases shall be disregarded.

1.5 When the CDOT Standard Specifications (as incorporated into the Project Agreement by the terms of this Appendix) refer to "Resident Engineer", "Agricultural Engineer", "Bridge, Construction or Maintenance Engineer", "TMC system inspector", "Concrete Engineer", "Project Engineer", "Materials Engineer", "Commissioner", "Structural Metals Engineer", "Department's Lighting Engineer", "Geotechnical Engineer" or any other specific Department special engineer, such references shall be deemed to be references to "the Department".

1.6 When the CDOT Standard Specifications (as incorporated into the Project Agreement by the terms of this Appendix) require an approval, acceptance, consent, approval or like assent of the Engineer or the Department for the use of alternative or substituted processes or components, references to "the Engineer" shall be disregarded.

1.7 If the CDOT Standard Specifications (as incorporated into the Project Agreement by the terms of this Appendix) require an approval, acceptance, consent, approval or like assent of any correction or repair that deviates from the requirements of the Project Agreement, such Approval, Acceptance, consent, approval or like assent must be given by the Department.

1.8 When the CDOT Standard Specifications (as incorporated into the Project Agreement by the terms of this Appendix) provide that reports, records or other documents shall be submitted to the Department or to the Engineer, such reports shall be required to be submitted to the Department only, unless stated otherwise.

1.9 When the CDOT Standard Specifications (as incorporated into the Project Agreement by the terms of this Appendix) require actions, materials, means or methods that are "either as indicated in the

Plans or as designated by the Engineer", the phrase "or as designated by the Engineer" shall be disregarded.

1.10 When the CDOT Standard Specifications (as incorporated into the Project Agreement by the terms of this Appendix) require any approvals, acceptances, consents, approvals or like assent to be given by the Department or the State, any references to the State shall be disregarded.

1.11 Sections 2.1 and 2.2 of the Project Agreement apply to the CDOT Standard Specifications (as incorporated into the Project Agreement by the terms of this Appendix), which shall be interpreted in accordance with such Sections as if the references in such Sections to "this Agreement" were references to "the CDOT Standard Specifications (as incorporated into the Project Agreement by the terms of this Appendix)".

1.12 If there is any conflict, ambiguity or inconsistency between or among:

a. any provision(s) of the Construction Standards and any provision(s) of the Project Agreement (including the Schedules), Section 2.4 of the Project Agreement shall apply; and

b. any provision(s) of the Construction Standards, the order of precedence set out in Section 105.09 of the CDOT Standard Specifications shall apply.

2. Division 100 of the CDOT Standard Specifications

Division 100 of the CDOT Standard Specifications is not incorporated into the Project Agreement by this Appendix except to the extent expressly specified in this Section 2, provided that (a) any method of measurement and payment related (including price adjustment) provisions shall not be incorporated into the Project Agreement and (b) any provision that refers to another provision of Division 100 that is not specified in this Section 2 shall not be incorporated into the Project Agreement.

101 – Definitions and Terms

102.10 – Material Guaranty

104.05 – Rights in and Use of Materials Found on the Work

105.02 – Plans, Shop Drawings, Working Drawings, Other Submittals and Construction

105.03 – Conformity to the Contract (first paragraph only)

105.07 – Conformity to Roadway Smoothness Criteria of HMA

105.08 – Conformity to Roadway Smoothness Criteria of Portland Cement Concrete Pavement

105.09 – Coordination of Plans, Specifications, Supplemental Specifications, and Special Provisions (order of precedence only)

105.18 – Load Restrictions

106.01 – Source of Supply and Quality Requirements

106.02 (b) – Materials Sources

106.03 – Samples, Tests, Cited Specifications (other than the final sentence)

106.04 – Qualifications of Testing Personnel and Laboratories

106.05 – Sampling and Testing of Hot Mix Asphalt

106.06 – Sampling and Testing of Portland Cement Concrete Paving

106.07 – Material Inspection at Plant

106.08 – Storage of Materials

106.09 – Handling Materials

107.06 – Safety, Health, and Sanitation Provisions

107.11 – Use of Explosives

107.12 – Protection and Restoration of Property and Landscape

107.17 – Contractor's Responsibility for Work (first and final paragraphs only)

107.23 – Archaeology and Paleontological Discoveries

108.03 – (a) Methods Statement

108.07 – Workplace Violence

3. DIVISIONS 200 TO 700 OF THE CDOT STANDARD SPECIFICATIONS

Divisions 200 through 700 are incorporated by reference into the Project Agreement except (1) as otherwise provided in the Project Agreement and (2) in Divisions 200 through 600, any method of measurement and payment related (including price adjustment) provisions shall not be incorporated into the Project Agreement. Any reference to a specific section of Divisions 200 to 700 in this Schedule 10 shall be deemed to be a reference to that section as modified by this Appendix and any other part of Schedule 10 where that section is modified.

4. CDOT STANDARD SPECIAL PROVISIONS

The Standard Special Provisions listed below are incorporated by reference into the Project Agreement as revisions to the CDOT Standard Specifications provided that:

a. in the case of the Standard Special Provisions listed that revise provisions of Division 100 of the CDOT Standard Specifications, such Standard Special Provisions shall only be incorporated by reference into the Project Agreement to the extent that they make revisions to provisions of Division 100 of the CDOT Standard Specifications that are incorporated into the Project Agreement pursuant to Section 2 of this Appendix; and

b. any method of measurement and payment related (including price adjustment) provisions included in the Standard Special Provisions listed shall not be incorporated into the Project Agreement.

STANDARD SPECIAL PROVISIONS

	Date	No. of Pages
Revision of Section 105 and 106 – Conformity To the Contract for HMA (Voids Acceptance)	(Jan 15, 2015)	10
Revision of Section 206, 304 and 613 – Compaction	(Nov. 10, 2016)	1
Revision of Section 401 – Composition of Mixtures – Voids Acceptance	(Feb 3, 2011)	1
Revision of Section 401 – Plant Mix Pavements	(Feb 3, 2011)	1
Revision of Section 401 – Reclaimed Asphalt Pavement	(May 2, 2013)	2
Revision of Section 401 – Tolerances for Hot Mix Asphalt (Voids Acceptance)	(Jan 6, 2012)	1
Revision of Sections 412 and 705 – Preformed Compression Seals	(Feb 3, 2011)	2
Revision of Section 502 – Extensions and Splices	(Apr 20, 2017)	2
Revision of Section 503 – Drilled Shafts	(Jan 12, 2017)	16
Revision of Section 504 – Concrete Block Facing MSE Wall	(Feb 3, 2011)	13
Revision of Section 504 – Soil Nail Wall	(Jan 12, 2017)	12
Revision of Section 612 – Flexible Delineators	(Jul 19, 2012)	1
Revision of Section 614 – Accessible Pedestrian Signal	(Nov 1, 2012)	3
Revision of Section 614 – Blank Out Sign (LED) (Speed Radar)	(Dec 29, 2011)	6

	Date	No. of Pages
Revision of Section 620 – Field Laboratories with Ignition Furnace	(Feb 3, 2011)	1
Partnering Program	(Feb 3, 2011)	1

Schedule 10B
Contract Drawings

In addition to all other requirements and obligations provided in this Project Agreement, the Developer shall develop the design and construct the Project in accordance with the Contract Drawings digitally attached as Exhibit A to this Schedule 10B, which are listed in Table 1 below.

Table 1. Contract Drawings

Doc #	Document
10.9	**Roadway**
10B.10.9.01	Roadway Typical Sections
10.10	**Railroads**
10B.10.10.01	100% UPRR Trackwork Plans and Specifications
10B.10.10.02	100% BNSF Trackwork Plans and Specifications
10.11	**Signing, Pavement Markings, Signalization, and Lighting**
10.13	**Structures**
10B.10.13.01	Structure Typical Sections
10.14	**Landscaping and Aesthetics**
10B.10.14.01	I-70 Cover Plans
10B.10.14.02	Aesthetic Design Standards for Central 70
10B.10.14.03	I-70 Cover and Swansea Elementary School Outdoor Areas Design Narrative
18	**Right-of-Way**
10B.18.01	Right-of-Way Exhibits City and County of Denver
10B.18.02	Right-of-Way Exhibits Onsite Outfall System[1]
10B.1 8.03	Right-of-Way Exhibits Private Ownership
10B.18.04	City and County of Denver Parcel Descriptions
10B.18.05	Private Ownership Parcel Descriptions
10B.18.06	Deeds for Conveyance to CDOT for ROW Purchases

[1] Subject to Section 1(i) of Part B of Schedule 28 (*Proposal Extracts*).

Exhibit A
Contract Drawings

Attached in digital format.

Schedule 11
Operations and Maintenance Requirements

1. GENERAL OPERATIONS AND MAINTENANCE REQUIREMENTS

1.1. General Requirements

1.1.1. Developer shall perform the O&M Work in accordance with the requirements of this Schedule 11. Developer shall ensure that the Project is operated, maintained and managed in a safe, effective, and reliable level of operation and condition for the duration of the O&M Period During Construction and the Operating Period.

1.1.2. All requirements in this Schedule 11 are applicable throughout the O&M Period During Construction and the Operating Period, unless otherwise specifically stated.

1.1.3. Developer Responsibility to Implement and Report Unplanned Closures

Without prejudice to Developer's obligations under Sections 4.2.2 and 4.2.3 of this Schedule 11 or any other provisions of this Agreement relating to Emergencies or Incidents, if Developer becomes aware of an Emergency, an Incident, an O&M Defect, or any other hazard as a result of which the normal use of any part of the Project would compromise the safety of Users, Developer shall immediately implement a Closure or other action necessary to mitigate the hazard. Regardless of the circumstances, Developer shall immediately inform the Department of the circumstances of any such Closure and shall coordinate with the Department, and other relevant Governmental Authorities that may be impacted by such Closure. The provisions of this Section 1.1.3 are without prejudice to the provisions of Schedule 6 (*Performance Mechanism*) and Section 2 of Schedule 10 (*Design and Construction Requirements*), including, for certainty, if any Closure implemented by Developer pursuant to this Section 1.1.3 is a Non-Permitted Closure (a) as a result of such Closure resulting in a breach of, or is not permitted by, any of Sections 2.5, 2.6 or 2.11 of Schedule 10 (*Design and Construction Requirements*) or (b) for any other reason.

1.1.4. Developer shall ensure that all surplus materials arising from the O&M Work be disposed of at such places as may lawfully be used for disposal, and shall comply with the Environmental Requirements to ensure that such materials will not cause or give rise to pollution of the Environment in contravention of any Environmental Law.

1.1.5. Standards

Subject to Section 8.6 of the Project Agreement, in performing the O&M Work Developer shall comply with the Project Standards, including (but, for certainty, not limited to):

a. in performing any Renewal Work, the Construction Standards (including those listed in Schedule 10A (*Applicable Standards and Specifications*)) to the extent applicable to the Renewal Work; and

b. in performing any O&M Work, the following documents as they are referenced in this Schedule 11 and to the extent applicable to the O&M Work:

i. AASHTO Manual for Bridge Element Inspection;

ii. AASHTO Manual for Bridge Evaluation;

iii. CDOT Bridge Rating Manual;

iv. CDOT Colorado Supplement Signs;

v. CDOT Distress Manual for HMA and PCC Pavements;

vi. CDOT Erosion Control & Stormwater Quality Guide;

vii. CDOT Highway Maintenance Levels of Service Manual;

viii. CDOT M&S Standard Plans;

ix. CDOT Manual of Maintenance Procedures;

x. CDOT Pavement Management Manual;

xi. CDOT Pontis Bridge Inspection Coding Guide;

xii. CDOT Recording and Coding Guide for the Inventory and Inspection of Colorado's Overhead Signs, Signals and High Mast Lights;

xiii. CDOT Roadside Vegetation Management (Final Guideline Document);

xiv. CDOT Sign Design Manual;

xv. CDOT Signing Policies and Procedures;

xvi. FHWA Bridge Inspector Reference Manual;

xvii. FHWA Highway and Rail Transit Tunnel Maintenance and Rehabilitation Manual;

xviii. FHWA National Bridge Inspection Standards (NBIS);

xix. FHWA National Tunnel Inspection Standards (NTIS);

xx. FHWA Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges (Report No. FHWA-PD-96-001);

xxi. FHWA Specifications for National Tunnel Inventory (SNTI);

xxii. FHWA Tunnel, Operations, Maintenance, Inspection, Evaluation (TOMIE) Manual;

xxiii. Manual of Uniform Traffic Control Devices (MUTCD), including the Colorado Supplement;

xxiv. National Electric Safety Code (NESC);

xxv. National Fire Protection Association (NFPA); and

xxvi. Other referenced AASHTO, ASTM and FHWA standards and manuals.

1.1.6. Toll Exempt O&M Work Vehicles

a. Developer (and its Subcontractors) shall be responsible for paying the applicable toll fee for use of the Tolled Express Lane(s) during the performance of the O&M Work, except in respect of any vehicles that are exempt from payment thereof pursuant to this Section 1.1.6.

b. Provided that:

i. Developer has submitted a written request to the Enterprises and has received authorization to use a non-revenue transponder for the relevant vehicle;

ii. the relevant vehicle has had such a transponder installed; and

iii. the relevant vehicle is being used specifically to carry out O&M Work on the Tolled Express Lane(s) or is anticipated to be used to respond to any Emergency,

the following vehicles will be exempt from payment of toll fees for the use of the Tolled Express Lanes:

iv. vehicles performing Courtesy Patrol Service services in accordance with Section 10 of, and Appendix B to, this Schedule 11;

v. vehicles performing Snow and Ice Control Services;

vi. vehicles used to perform sweeping and cleaning services in accordance with this Schedule 11;

vii. vehicles used to perform scheduled Routine Maintenance or Renewal Work on the Tolled Express Lanes, where such scheduled work is identified in the mostly recently Accepted MMP; and

viii. vehicles used to respond to an Emergency.

1.1.7. Unless the context requires, or unless expressly provided, otherwise, all references in this Schedule 11 to Developer's obligations in relation to Elements that are within or form part of the Limited O&M Work Segments shall be construed in the context of Developer's obligation to perform O&M Work on the Limited O&M Work Segments being limited to the performance of Limited O&M Work thereon.

2. O&M SCOPE AND LIMITS DURING CONSTRUCTION

2.1. O&M Limits During Construction

2.1.1. Developer shall perform O&M Work During Construction within the O&M Limits During Construction in accordance with this Section 2 and the other provisions of this Schedule 11 that apply during the O&M Work During Construction Period.

2.1.2. Developer shall submit O&M Limits During Construction drawings to, and obtain Acceptance thereof from, the Department prior to the issuance of NTP2. The O&M Limits During Construction drawings produced by Developer shall (a) include the Site for the entire Project, (b) reference the O&M Limits Reference Drawings, and (c) comply with the requirements of this Section 2 and other provisions of this Schedule 11 that apply during the O&M Work During Construction Period. The drawings shall clearly detail Developer's responsibilities and interface of operations and maintenance activities performed by others, and shall be presented in both detailed plans and cross section drawings. The drawings shall also be consistent with Developer's design, and shall additionally be updated for Approval as required during the Construction Period to reflect changes to the as-built Project.

2.2. O&M Scope During Construction

During the O&M Period During Construction (except to the extent expressly provided otherwise in this Section 2.2 or, as applicable, in Appendix D to this Schedule 11), Developer shall comply with the following obligations set out in this Section 2.2.

2.2.1. I-70 Mainline and Associated Infrastructure

Developer shall perform:

a. O&M Work, other than Snow and Ice Control Services (to which Sections 2.2.2.b and 11 of this Schedule 11 shall apply), on:

i. the I-70 Mainline (other than the Limited O&M Work Segments);

ii. such infrastructure and portions of the CDOT Roadways as (in the case of both such infrastructure and CDOT Roadways) are identified as 'Developer O&M Work' in the O&M Limits Reference Drawings;

iii. such structures as are identified as 'Developer' responsibility in Appendix D to this Schedule 11, and all retaining wall structures constructed by Developer; and

iv. such Elements as are identified as CDOT maintenance responsibility in Exhibit A of the Intergovernmental Maintenance Agreement for the maintenance services of Central Park Boulevard Bridge, dated August 28, 2009; and

b. Limited O&M Work on the Limited O&M Work Segments, including for certainty:

i. such infrastructure as is identified as 'Developer Limited O&M Work' in the O&M Limits Reference Drawings; and

ii. such structures as are identified as 'Developer (Limited O&M Work)' responsibility in Appendix D to this Schedule 11;

so as to comply with the applicable General Requirements and to meet or exceed the applicable Targets, in each case as set out in Appendix A-1 to this Schedule 11.

2.2.2. Local Agency Infrastructure

Developer shall perform:

a. O&M Work (except Incident response, sweeping and cleaning and Snow and Ice Control Services) on Local Agency Roadways and all infrastructure Elements (including the structures identified as Developer responsibility in Appendix D to this Schedule 11) owned by Local Agencies;

b. Incident response, sweeping and cleaning and Snow and Ice Control Services on those Local Agency Roadways and infrastructure Elements (including the structures identified as Developer responsibility in Appendix D to this Schedule 11), or any portions thereof, where Developer is performing Construction Work thereon and/or has a street occupancy Permit with the relevant Local Agency in relation thereto, as well as being responsible for meeting all other conditions of any relevant Permit; and

c. any other O&M Work as may be required by the terms of any such street occupancy Permit,

so as to comply with the applicable General Requirements and to meet or exceed the applicable Targets, in each case as set out in Appendix A-1 to this Schedule 11.

2.2.3. Drainage

a. Developer shall perform the O&M Work of the Onsite Outfall System and the Offsite Outfall System.

b. Developer shall perform the O&M Work on the groundwater treatment facility constructed by it pursuant to Section 8.4.4.f. of Schedule 10 (*Design and Construction Requirements*), and shall ensure that such facility is functional and capable of meeting the RHM treatment requirements specified in such Section.

c. Developer shall perform the O&M Work of the dewatering system constructed by it pursuant to Section 8.4.4.e.iv. of Schedule 10 (*Design and Construction Requirements*), and shall ensure that such system is functional and capable of meeting the dewatering requirements specified in such Section.

d. Developer shall obtain and comply with all Permits identified in Section 8.3.3 of Schedule 10 (*Design and Construction Requirements*) applicable to the performance of the O&M Work in relation to drainage.

2.2.4. Water Quality

Developer shall comply with the conditions of the most current version of the Department's MS4 permit, including inspections and annual reporting requirements. Developer shall furnish the required documents in accordance with the permit to the Department for Acceptance. The required annual report shall be submitted to the Department for Acceptance by December 31st of each Calendar Year.

2.2.5. Maintenance Yard

From the Snow and Ice Control Commencement Date for the remainder of the O&M Period During Construction and during the Operating Period, Developer shall perform O&M Work of the Maintenance Yard and associated facilities that are used by Developer to meet the requirements of Schedule 11. Developer may coordinate with the Department after NTP 2 and in advance of the Snow and Ice Control Commencement Date with respect to temporary co-location of Developer's equipment in the Maintenance Yard to facilitate Developer's preparation for performance of Snow and Ice Control Services, provided that:

a. any such co-location arrangement agreed to by the Department shall be subject to such conditions as the Department may require and Developer having provided (or having

procured that a Subcontractor has provided) (i) satisfactory evidence to the Department that there is in place all necessary insurance coverage required by the Department in connection with such arrangement and any access rights and activities associated therewith and (ii) waivers of subrogation against the Enterprises and CDOT for any claims to the extent covered and paid by such insurance; and

b. Developer, and not the Department, shall be responsible for any costs and expenses associated with Developer's satisfaction of the conditions required by the Department pursuant to this Section 2.2.5.

2.2.6. ITS and ETC Facilities

a. Developer shall ensure that all existing ITS facilities (including all items in Appendix B to Section 3 of Schedule 10) are maintained and operational. This Developer responsibility shall include addressing issues identified by equipment failure reports that are regularly generated by the Department's CTMC. Any impact to the operation of these existing ITS facilities shall be rectified by Developer. The Department will continue to operate the existing facilities.

b. Developer shall inspect all ITS and ETC facilities (including all items in Appendix B to Section 3 of Schedule 10) and report any issues or required repairs to the ETC System Integrator and CTMC and keep a log of such reports. The issues and repair log shall be included in Monthly O&M Reports prepared by Developer in accordance with Section 13 (*Reporting and Liaison*) of this Schedule 11.

c. Developer shall also be responsible for O&M Work with respect to ITS and ETC facilities in accordance with Appendix B to Section 3 (*ITS and Tolling Equipment*) of Schedule 10 (*Design and Construction Requirements*).

2.2.7. Utility Service

During the O&M Period During Construction and the Operating Period prior to Final Acceptance, Developer shall be responsible for payment of all Utility service fees and maintenance of Utility services (including pursuant to Section 2.2.8.a of this Schedule 11) unless specified otherwise in the sub-columns "During Construction" in Appendix E to Section 4 (*Utilities*) of Schedule 10 (*Design and Construction Requirements*).

2.2.8. Traffic Signals and Lighting

a. Traffic signals, lighting and their associated equipment and power are the responsibility of Developer where, in relation to a Local Agency Roadway, it is performing Construction Work and/or has a street occupancy Permit for work that includes signals, lighting and/or associated equipment. Developer shall also perform O&M Work on temporary lighting used by Developer along any roadway as required by Appendix A-1 to this Schedule 11.

b. Developer shall inspect traffic signals, lighting and associated equipment and report outages, O&M Defects, damage or vandalism in respect thereof as required by Appendix A-1 to this Schedule 11. Developer shall additionally remove any graffiti on traffic signals and lighting as required by Appendix A-1 to this Schedule 11.

2.2.9. Railway Structures

Developer shall perform the O&M Work on Railroad structures identified as Developer responsibility in Appendix D to this Schedule 11 in compliance with the RRAs and applicable PUC Rulings. The maintenance of the ballast, tracks and signals shall not be Developer's responsibility.

2.2.10. Fencing

a. Developer's O&M Work responsibility shall include all fencing on the Site, with the exception of:

i. Fencing owned by local residents or businesses that are constructed by Developer; and

b. Railroad fences.

2.3. **Baseline Inspections and Baseline Asset Condition Report**

2.3.1. Developer shall:

a. carry out inspections and tests to determine the existing condition of each Element of the Project (excluding all Elements within or forming part of the Limited O&M Work Segments) to be maintained by Developer during the O&M Period During Construction pursuant to this Schedule 11 (the "Baseline Inspections"); and

b. prepare a report (the "Baseline Asset Condition Report (BACR)"), which shall:

i. list in detail all such Elements that are required to be subject to the Baseline Inspections;

ii. assess and describe the existing condition of all such Elements (including details such as photographs or test results, as applicable), which description and condition assessment reporting shall:

A. be by reference to CDOT's Highway Level of Service Manual; and

B. at a minimum, include, but not be limited to, all such Elements listed in Appendix A-1 to this Schedule 11, referencing additionally any other assessment criteria identified in Appendix A-1;

iii. by updating the Performance and Measurement Table set out in Appendix A-1 to this Schedule 11, list the Target minimum baseline asset condition in accordance with which such Elements will be maintained by Developer during the O&M Period During Construction, which such Target minimum baseline condition shall allow for the safe and reliable operation of the existing asset and shall meet or exceed the existing condition of the relevant Element, except to the extent that a Target is specified for such Element in Appendix A-1 of this Schedule 11, in which instance the specified Target condition shall be the minimum baseline asset condition.

2.3.2. Developer shall submit the proposed scope of the Baseline Inspections it intends to carry out, together with the methodology proposed and the list of qualified testing organizations in carrying out the proposed scope ("Baseline Asset Condition Inspection Plan") to, and obtain the Acceptance thereof from, the Department prior to the issuance of NTP2. Following Acceptance by the Department of the Baseline Asset Condition Inspection Plan, Developer shall provide to the Department a minimum of ten Working Days' written notice prior to the commencement of the Baseline Inspections.

2.3.3. After carrying out the Baseline Inspections, Developer shall submit the Baseline Asset Condition Report (BACR) to, and obtain the Acceptance thereof from, the Department prior to the issuance of NTP2. The Accepted BACR shall be an appendix to the Maintenance Management Plan submitted to the Department pursuant to Section 5 of this Schedule 11.

3. O&M SCOPE AND LIMITS AFTER CONSTRUCTION

3.1. O&M Limits After Construction

3.1.1. Developer shall perform O&M Work After Construction within the O&M Limits After Construction in accordance with this Section 3 and the other provisions of this Schedule 11 that apply during the Operating Period.

3.1.2. Developer shall submit O&M Limits After Construction drawings to, and obtain the Acceptance thereof from, the Department prior to Substantial Completion. The O&M Limits After Construction drawings produced by Developer shall (a) include the Site for the entire Project, (b) reference the

O&M Limits Reference Drawings, and (c) comply with the requirements of this Section 3 and other provisions of this Schedule 11 that apply during the Operating Period. The drawings shall clearly detail Developer's responsibilities and interface of operations and maintenance activities performed by others, and shall be presented in both detailed plans and cross section drawings. The drawings shall reflect the as-built condition of the Project, and shall be updated if the as-built condition changes.

3.2. **O&M Scope After Construction**

During the Operating Period (except to the extent expressly provided otherwise in this Section 3.2), Developer shall comply with the following obligations set out in this Section 3.2.

3.2.1. I-70 Mainline and Associated Infrastructure

Developer shall perform

a. the O&M Work, other than Snow and Ice Control Services (to which Sections 3.2.2.b and 11 of this Schedule 11 shall apply), on:

i. the I-70 Mainline (other than the Limited O&M Work Segments);

ii. such infrastructure and portions of the CDOT Roadways as (in the case of both such infrastructure and CDOT Roadways) are identified as 'Developer O&M Work' in the O&M Limits Reference Drawings;

iii. such structures as are identified as Developer responsibility in Appendix D to this Schedule 11, and all retaining wall structures constructed by Developer that are along or adjacent to the I-70 Mainline and the Local Agency Roadways, other than retaining walls on CDOT Roadways; and

iv. such Elements as are identified as CDOT maintenance responsibility in Exhibit A of the Intergovernmental Maintenance Agreement for the maintenance services of Central Park Boulevard Bridge, dated August 28, 2009, and

b. Limited O&M Work on the Limited O&M Work Segments, including for certainty:

i. such infrastructure as are identified as 'Developer Limited O&M Work' in the O&M Limits Reference Drawings; and

ii. such structures as are identified as 'Developer (Limited O&M Work)' responsibility in Appendix D to this Schedule 11;

so as to comply with the applicable General Requirements and to meet or exceed the applicable Targets, in each case as set out in Appendix A-2 to this Schedule 11.

3.2.2. Local Agency Infrastructure

Developer shall perform:

a. O&M Work on all Local Agency Roadways identified as "Developer O&M Work" in the O&M Limits Reference Drawings (with exception of lighting);

b. O&M Work (except Snow and Ice Control Services) on the portion of 46th Avenue N and 46th Avenue S between Brighton Boulevard and York Street that is identified as "Developer O&M Work except for Snow and Ice Control Services" in the O&M Limits Reference Drawings (with exception of lighting);

c. O&M Work (except Incident response, sweeping and cleaning and Snow and Ice Control Services) on all Local Agency cross street structures identified as Developer responsibility in Appendix D to this Schedule 11 that connect to Local Agency Roadways (with the exception of signage, traffic signals, lighting, and pavement marking);

d. Incident response, Snow and Ice Control Services and sweeping and cleaning for Local Agency cross street structures identified as Developer responsibility in Appendix D to this Schedule 11 where Developer is performing Renewal Work thereon and/or has a street

occupancy Permit with the relevant Local Agency in relation thereto, as well as being responsible for meeting all other conditions of the relevant Permit; and

e. any other O&M Work as may be required by the terms of any such street occupancy Permit,

so as to comply with the applicable General Requirements and to meet or exceed the applicable Targets, in each case as set out in Appendix A-2 to this Schedule 11.

3.2.3. Cover

a. Developer shall perform Cover O&M Work, which for clarity applies to the Cover in relation to Planning Area 2 as shown in the I-70 Cover Plans. Developer shall comply with the Accepted Tunnel Operation, Maintenance, Inspection and Evaluation Manual (TOMIE) as described in Section 12 (*Cover MEP System*) of Schedule 10 (*Design and Construction Requirements*) in relation to the Cover O&M Work.

b. Developer shall be responsible for the operation, maintenance, and monitoring of the Command Control and Monitoring System (CCMS) as described in Section 12 (*Cover MEP System*) of Schedule 10 (*Design and Construction Requirements*) in relation to the Cover and immediate approaches. Developer's responsibility shall include the communications system up to the CDOT backbone, including maintained connectivity. Developer shall also be responsible for the O&M Work of the 96 strand fiber optic cable and laterals for the Cover MEP System devices, all network equipment, connections, computers, software, and servers on the Developer's side of the firewall. Developer shall provide a trained and dedicated staff with 24/7 presence co-located at the CTMC to operate the CCMS. Developer's 24/7 operation of the CCMS shall not assume reliance or assistance from Department personnel at the CTMC to carry out Developer's responsibility at any time.

c. Developer shall coordinate with the Department in respect of operations of the ITS associated with the Cover.

d. Developer shall coordinate with the relevant Local Agency's fire department with respect to the maintenance and operation of fire detection and firefighting equipment.

e. Developer shall develop a manual (the "Cover Top O&M Manual") that outlines (1) pertinent Cover design and construction information, (2) recommended operations and maintenance requirements, procedures and protocols and (3) recommended procedures and protocols for coordination between the Cover Maintainer and Developer, in all cases, relevant to the performance of the Cover Top O&M Work by the Cover Maintainer. The Cover Top O&M Manual shall be submitted and be Approved by the Department prior to Substantial Completion. The Cover Top O&M Manual shall include details such as:

i. Design and construction documentation and drawings;

ii. Video recording of installation of key components on top of the Cover, including structural elements, waterproofing membrane, drainage system, garden roof assembly, and other relevant components identified in consultation with the Department and the Cover Maintainer;

iii. Recommended load restrictions on the Cover;

iv. Waterproofing layer damage preventative measures, procedures, or protocols to be carried out during the performance of the Cover Top O&M Work;

v. Snow removal and storage restrictions;

vi. Elements requiring regular inspections and maintenance, and the frequency and procedures of such inspections and maintenance;

vii. Record keeping of Cover Top O&M Work, and the frequency of provision of such records to the Department;

viii. Developer review timeline and requirement for any major modification by the Cover Maintainer on top of the Cover that would impact Developer's carrying out of the Cover O&M Work;

ix. Reference to the Landscape Maintenance Plan as required in Section 14 (*Landscaping and Aesthetics*) of Schedule 10 (*Design and Construction Requirements*);

x. Other coordination and interface requirements with Developer; and

xi. Any other documentation, recommendations, requirements, restrictions, measures, procedures, protocols, coordination matters as deemed necessary by the Department (acting reasonably) that are pertinent to the Cover Top O&M Work.

f. Developer shall, notwithstanding the Cover Maintainer's responsibility to perform the Cover Top O&M Work, proactively coordinate with the City of Denver and the Cover Maintainer with respect to the performance of the Cover Top O&M Work and, as necessary, the Cover O&M Work.

g. Developer shall be responsible for any damage caused by a Developer-Related Entity to any elements on the Cover that fall within the scope of the Cover Top O&M Work, including, as appropriate, the repair, restoration, or replacement of such elements.

3.2.4. Railway Structures

Developer shall perform the O&M Work on Railroad structures identified as Developer responsibility in Appendix D to this Schedule 11 in compliance with the RRAs and applicable PUC Rulings. The maintenance of the ballast, tracks and signals shall not be Developer's responsibility.

3.2.5. Utility Infrastructure

Developer shall be responsible for O&M Work of any structures constructed by Developer to carry utility infrastructure.

3.2.6. Drainage

a. Developer shall perform the O&M Work of the Onsite Outfall System and the Offsite Outfall System.

b. Developer shall perform the O&M Work of the groundwater treatment facility constructed by it pursuant to Section 8.4.4.f. of Schedule 10 (*Design and Construction Requirements*), and shall ensure that such facility is functional and capable of meeting the RHM treatment requirements specified in such Section.

c. Developer shall perform the O&M Work of the dewatering system constructed by it pursuant to Section 8.4.4.e.iv. of Schedule 10 (*Design and Construction Requirements*), and shall ensure that such system is functional and capable of meeting the dewatering requirements specified in such Section.

d. Developer shall obtain and comply with all Permits identified in Section 8.3.3 of Schedule 10 (*Design and Construction Requirements*) applicable to the performance of the O&M Work in relation to drainage.

3.2.7. Water Quality Facilities

The Developer shall comply with the conditions of the most current version of the Department's MS4 permit, including inspections and annual reporting requirements. Developer shall furnish the required documents in accordance with the permit to the Department for Acceptance. The required annual report shall be submitted to the Department for Acceptance by December 31st of each Calendar Year.

3.2.8. ITS and ETC Facilities

a. Developer shall be responsible for O&M Work of the ITS and ETC civil infrastructure as identified and in accordance with Appendix B to Section 3 (*ITS and Tolling Equipment*) of Schedule 10 (*Design and Construction Requirements*).

b. Developer shall also be responsible for O&M Work with respect to ITS and ETC facilities as identified and in accordance with Appendix B to Section 3 (*ITS and Tolling Equipment*) of Schedule 10 (*Design and Construction Requirements*).

c. For the duration of the period commencing at the operation of the Developer installed ITS facilities up to two years following Final Acceptance, Developer shall identify and appoint a person qualified in installing, maintaining, troubleshooting, and repairing the ITS facilities and communications infrastructure (such person's qualification shall be submitted to the Department for Approval). Developer shall maintain the ITS facilities installed by Developer and backbone communications such that they are fully operational and functional during this period. This Developer responsibility shall include addressing issues identified by equipment failure reports that are regularly generated by the Department's CTMC.

d. During the Operating Period Developer shall inspect the ITS and ETC facilities (including any facilities that are maintained and operated by others) and report any issues or required repairs to the ETC System Integrator and CTMC and keep a log of such reports. The issues and repair log shall be included in Monthly O&M Reports prepared by Developer in accordance with Section 13 (*Reporting and Liaison*) of this Schedule 11.

3.2.9. Utility Service

Subject to Section 3.2.11 of this Schedule 11, after Final Acceptance Developer shall be responsible for payment of Utility service fees and maintenance of Utility services unless specified otherwise in the sub-columns "Operating Period" in Appendix E to Section 4 (*Utilities*) of Schedule 10 (*Design and Construction Requirements*).

3.2.10. Landscaped and Vegetated Areas

Developer shall perform the O&M Work of all landscaped and vegetated areas in accordance with the requirements of this Schedule 11 and Section 14 of Schedule 10 (*Design and Construction Requirements*):

a. on the Site, with the exception of any such areas on top of the Cover; and

b. on top of the Cover until the end of the Landscape Warranty period as described in Section 14.11 of Schedule 10 (*Design and Construction Requirements*).

3.2.11. Traffic Signals and Lighting

a. Lighting (other than lighting beneath the Cover) and signals operation after Final Acceptance will not be the responsibility of Developer.

b. Developer shall inspect traffic signals and lighting and report outages, O&M Defects, damage, or vandalism in respect thereof as required by Appendix A-2 to this Schedule 11. Developer shall additionally remove any graffiti on traffic signals and lighting as required by Appendix A-2 to this Schedule 11.

3.2.12. Fencing

Developer's O&M Work responsibility shall include all fencing on the Site, with the exception of:

a. Fencing owned by local residents or businesses that are constructed by Developer; and

b. Railroad fences.

3.2.13. Signage

Developer shall not be responsible for the O&M Work with respect to pedestrian warning signage at each location that includes rectangular rapid flashing beacons (RRFB) and advanced warning signs as shown in the Free Right Turn Signing Exhibit provided in the Reference Documents.

4. PERFORMANCE REQUIREMENTS AND RESPONSIBILITIES

Developer shall be responsible for and shall take all necessary actions to ensure that all O&M Defects are remedied to allow for the safe, effective and reliable operation of the Project. Developer shall ensure that every Element identified in Appendix A to this Schedule 11 (as updated in accordance with, respectively, Sections 2.3.1.b.iii and 4.2.6.a of this Schedule 11) is in a condition that (as a result of its performance of its obligations under this Schedule 11) complies with the applicable General Requirements and meets or exceeds the applicable Targets, in each case, as set out in Appendix A-1 to this Schedule 11 (as updated in accordance with this Schedule 11) during the O&M Period During Construction and Appendix A-2 to this Schedule 11 (as updated in accordance with this Schedule 11) during the Operating Period.

4.1. Categorization of O&M Defects

4.1.1. Developer shall employ personnel who are trained to make the appropriate categorization of O&M Defects and maintain a record of the circumstances of the O&M Defect and how it was categorized.

4.1.2. Whenever an O&M Defect is identified, Developer shall make a determination as to whether it is:

a. a Category 1 Defect, in which event Developer shall take all necessary action to mitigate and remedy the O&M Defect in accordance with Section 4.2.2 of this Schedule 11; or

b. a Category 2 Defect in an Element, in which event Developer shall take all necessary action to mitigate and remedy the O&M Defect in accordance with Section 4.2.3.a of this Schedule 11 and comply with Section 4.2.3.b of this Schedule 11.

4.2. Performance and Measurement Mechanism

The Performance and Measurement Tables assign the following obligations to Developer for each Element during the O&M Period During Construction and the Operating Period, as applicable.

4.2.1. General Requirements

Developer shall take action to ensure that each Element complies with the General Requirements applicable to such Element during the O&M Period During Construction and the Operating Period. Without prejudice to the definition of O&M Defect in Part A of Annex A (*Definitions and Abbreviations*) to the Project Agreement, an O&M Defect shall be deemed to exist if at any time an Element or part of an Element fails to comply with the applicable General Requirements.

4.2.2. Category 1 – Immediate Action

a. The first sub-column of the “Defect Remedy Period” column in the Performance and Measurement Tables is entitled “Cat. 1 Immediate Action” and sets out, for each Element, the maximum time period following the time when Developer first becomes (or should have become) aware of the existence of the relevant O&M Defect within which Developer shall take and complete action that will mitigate a Category 1 Defect in such manner that the immediate or imminent hazard, nuisance and/or risk that caused it to be a Category 1 Defect is alleviated.

b. Such actions may be, depending on the nature of the O&M Defect, to alert Users and provide temporary safety measures, and/or to alert Users and provide temporary repairs that will alleviate the immediate or imminent hazard, nuisance and/or risk within the applicable Defect Remedy Period specified for Cat 1 – Immediate Action.

4.2.3. Category 2 – Permanent Repair

a. The second sub-column of the "Defect Remedy Period" column in the Performance and Measurement Tables is entitled "Cat. 2 Permanent Repair" and sets out, for each Element, the maximum time period following the time when Developer first becomes (or should have become) aware of the existence of the relevant O&M Defect within which Developer shall complete a permanent repair of a Category 2 Defect in Elements. A permanent repair may include a full replacement of an Element or action that is planned to be undertaken as part of Renewal Work.

b. Developer shall monitor Category 2 Defects in all Elements and shall not allow a Category 2 Defect to deteriorate into a Category 1 Defect for all Elements.

4.2.4. Measurement Criteria

The first column under the heading "Performance Requirements" in the Performance and Measurement Tables is entitled "Measurement Criteria" and sets out, for each Element, the criteria by which the condition of each Element is to be measured.

4.2.5. Target

The second column under the heading "Performance Requirements" in the Performance and Measurement Tables is entitled "Target" and sets out, for each Element, a threshold for each of the specified Measurement Criteria. Without prejudice to the definition of O&M Defect in Part A of Annex A (*Definitions and Abbreviations*) to the Project Agreement, an O&M Defect shall be deemed to exist if the measured value applicable to any of the Measurement Criteria does not meet or exceed the threshold identified as the Target condition.

4.2.6. Updates to Performance Requirements during the Operating Period

a. Developer may submit to the Department for Approval proposed updates, if any, to the Performance and Measurement Table set out in Appendix A-2 to this Schedule 11 no later than 90 Calendar Days before the then anticipated Substantial Completion Date to reflect Good Industry Practice and specific attributes of Developer's final plan set (for example, where the final plan set incorporates a feature that is not included as an Element in such Performance and Measurement Table). Developer may thereafter submit to Department for Approval any proposed updates no later than 60 Calendar Days before the start of each subsequent Contract Year to reflect Good Industry Practice.

b. The Department shall be entitled at any time to require Developer to adopt amendments to any of the Performance Requirements in such Performance and Measurement Table where such amendments are required to comply with then-current Good Industry Practice and under the following conditions:

i. the measurement scale associated with the original Measurement Criteria is superseded and no longer complies with Good Industry Practice; and

ii. the new Target shall be determined using the principle that compliance with the new Target shall achieve the same standard of performance, frequency of O&M Work and User satisfaction as would have been achieved through Developer's compliance with the original Measurement Criteria and Target.

For example, the Department may require skid resistance to be reported using a different measurement scale from that in current use and would be entitled (subject to calibration between new and old measurement scales to demonstrate equivalence of performance, frequency of O&M Work and User satisfaction) to require the adoption of an amendment to both the Measurement Criteria and Target for this Element.

5. MAINTENANCE MANAGEMENT PLAN

5.1. General

5.1.1. Developer shall prepare a Maintenance Management Plan (MMP) that is consistent with its maintenance obligations under this Schedule 11 and that defines the processes and procedures for complying with its maintenance obligations.

5.1.2. Developer shall provide, and keep updated, processes and procedures in the MMP to ensure that:

a. all Elements comply with the applicable General Requirements and meet or exceed the applicable Targets; and

b. all required action is taken and completed in relation to O&M Defects within the applicable Defect Remedy Periods in accordance with Sections 4.2.2 and 4.2.3 of this Schedule 11.

5.1.3. Developer shall submit the MMP, which shall be consistent with and expand upon the draft MMP submitted with the Proposal, and obtain the Acceptance thereof from, the Department prior to the issuance of NTP2 and shall submit an updated version to the Department for Acceptance by the Department prior to Substantial Completion. In addition, the MMP shall be updated and submitted for Acceptance annually no later than 60 Calendar Days before the end of each Contract Year. The MMP shall also be updated more frequently as required during the Construction Period or Operating Period to indicate changes to relevant protocols, agreements, and other interactions with other entities and to indicate requirements for equipment and systems that have been revised, upgraded, or replaced. Developer shall at all times comply with the latest Accepted MMP.

5.2. Maintenance Management Plan Contents

5.2.1. The MMP submitted (i) prior to the issuance of NTP2, shall include, at a minimum, the following elements in respect of both the O&M Work During Construction Period and the Operating Period (except to the extent that any such element is inapplicable to the relevant period and, where applicable, identifying any differences between such periods) and (ii) prior to Substantial Completion, shall include, at a minimum, the following elements in respect of the Operating Period (except to the extent that any such element is inapplicable to such period):

a. A complete organizational chart and staffing plan that shows the personnel including the O&M Manager required for all maintenance activities required in this Schedule 11, including for example Routine Maintenance and Renewal Work; Emergencies; inspections; and management. A contact list shall be provided. Personnel qualifications for each position, required training, anticipated work hours, and work locations including personnel training requirements for operating in traffic zones shall be included;

b. The experience and qualification requirements for personnel to be engaged in all inspection work setting out training that is to be provided for all aspects of inspections including as a minimum specialist inspections (e.g. Cover), routine inspections, and safety related inspections;

c. Developer's O&M Safety Plan that complies with the requirements of Section 5.3 of this Schedule 11, including procedures for providing Project-specific safety training for all personnel engaged in maintenance and inspection activities for the Project;

d. Developer's O&M Quality Management Plan (OMQMP) setting out arrangements for quality management and assurance that complies with the requirements of Section 5.4 of this Schedule 11;

e. Drawings, in a size and format that is legible, delineating the O&M Limits During Construction (in the case of the MMP submitted prior to the issuance of NTP2) and the O&M Limits After Construction (in the case of the MMP submitted prior to Substantial

Completion) and detailing the limits of infrastructure to be maintained by the Department or by the relevant Local Agency, including the use of photos to illustrate detailed limits;

f. Location and layout of maintenance and storage facilities, vehicles and equipment, tools, computers, software and other major assets/items including procedures for ensuring all necessary maintenance equipment and materials are readily available;

g. Procedure for communications and coordination with the Department for scheduling repairs and Closures for maintenance, including minimum time period of notification to the Department on scheduled repairs or Closures;

h. Procedure for coordination of activities, including repairs/renewals/replacements and Closures, with other entities having interests within and adjacent to the Project, including Utilities;

i. Approach to the identification and recording of O&M Defects and their repair including the approach and training of personnel in the correct assignment of "Category 1 – Immediate Action" and "Category 2 – Permanent Repair" O&M Defect status including procedures and scheduled frequency of safety inspections;

j. Procedures for responding in a timely manner to Category 1 Defects and Category 2 Defects;

k. Procedures for monitoring and maintaining the condition and performance of the Project to meet the General Requirements, the Performance Requirements and Defect Remedy Periods and updates thereof. Procedures shall include the inspection routines, checklists, frequency for each of the inspection routines, and equipment and tools needed for the inspections. The MMP shall set forth the conditions where the frequency of inspections for a particular asset, component or group of assets may be increased due to the ageing of an asset or increased wear and tear;

l. Reference to procedures for traffic control and management during periods of Closures, with inclusion or reference to Transportation Management Plan and maintenance of traffic requirements in Section 2 (*Maintenance of Traffic*) of Schedule 10 (*Design and Construction Requirements*) in respect of O&M Work During Construction and, in respect of O&M Work After Construction, the same requirements as if they applied to O&M Work After Construction;

m. Procedure for investigation and response to complaints or reports of O&M Defects or Noncompliance Events received from the Department or other sources;

n. Work plans and schedules for undertaking Routine Maintenance activities and Renewal Work during the O&M Period During Construction based on the Baseline Asset Condition Report and during the Operating Period based on routine inspections, which plans and schedules shall include the information required by Section 5.2.2 of this Schedule 11;

o. Description of Developer's approach to life cycle assumptions and Renewal Work and interfaces with the Renewal Work Plan during the O&M Period During Construction based on the Baseline Asset Condition Report and during the Operating Period based on routine inspections;

p. Procedure for record keeping according to Developer's MQMP;

q. Procedure for tracking O&M Defects, performance compliance and corrections (repairs, renewal, replacements);

r. Procedure for maintaining a comprehensive, accurate, and auditable spare parts and inventory level to address the maintenance obligations. This information contained in the inventory shall be compatible with the Maintenance Management Information System (MMIS) as described in this Schedule 11;

s. Description of Developer's MMIS and its functionality;

t. Details and steps of transition of maintenance activities from the Department or Local Agency necessary to achieve a seamless transition to Developer, and to allow for continuity of service (24 hours per day, seven days per week, and every day of the year) to Users. The details and steps shall outline any phased transition of operations and maintenance activities, including anticipated timeline of such phased transition;

u. Maintenance and service manuals including detailed technical and servicing descriptions for all Elements assessed as well as software and equipment that is required for the O&M Work. The manual shall include preventative maintenance schedules, testing and diagnostic procedures, trouble-shooting techniques, corrective measures, both temporary and permanent, the location and availability of support services, point to point component wiring schematics and logic signal flows, and assembly and disassembly drawings, including exploded view drawings. Standard service manuals for unmodified commercial products are acceptable for inclusion in the MMP provided that they contain details and accurate information in order to properly service the specific equipment related to the Elements. The manual in relation to the Cover shall comply with the requirements for the TOMIE Manual that is required in accordance with Section 12 of Schedule 10 (*Design and Construction Requirements*);

v. Description of all Elements, including an inventory of facilities, systems and equipment to be maintained by Developer, including a logical system breakdown of all Elements, including facilities, equipment and systems and the levels of maintenance and summary of maintenance tasks to be provided by Developer;

w. List of the maintained Elements major systems and equipment manufacturers/vendors, including their contact information (contact person, address, telephone numbers, website address and e-mail address);

x. A list of unplanned but anticipated maintenance services for all road Elements;

y. Repair procedures for repairs that are anticipated;

z. Inclusion or reference to O&M Work activities and details necessary to comply with Schedule 17 (*Environmental Requirements*), Section 8 (*Drainage*) of Schedule 10 (*Design and Construction Requirements*), Section 14 (Landscaping and Aesthetics) of Schedule 10 (*Design and Construction Requirements*), and any other Schedule 10 (*Design and Construction Requirements*) requirements in relation to operations and maintenance;

aa. Inspection plan and copies of all inspection forms and checklists; and

bb. How best management practices will be applied.

5.2.2. The MMP shall include Developer's schedules and associated plans for Routine Maintenance and Renewal Work. These schedules and plans shall set forth the type of O&M Work, anticipated timing, durations, frequency of each task, intended traffic management arrangements, and reporting requirements. Maintenance schedules shall include:

a. Monthly Routine Maintenance Schedule;

b. Annual Routine Maintenance Schedule;

c. Annual Renewal Work Schedule, which shall be consistent with the Renewal Work Plan; and

d. Five Year Renewal Work Schedule, which shall be consistent with the Renewal Work Plan.

5.2.3. The MMP shall include the latest versions of:

a. The Performance Requirements in the form most recently Accepted by the Department following the procedure for updates to the Performance and Measurement Tables in accordance with Section 4.2.6 of this Schedule 11, if applicable; and

b. The actual Useful Life for each Renewal Element, which such document shall reflect the Useful Life Baseline Requirements Table in the form most recently Accepted by the Department following the procedure for updates to the Useful Life Baseline Requirements Table as set forth in Section 6.1.4 of this Schedule 11.

5.2.4. The MMP shall append the following :

a. Baseline Asset Condition Report;

b. Renewal Work Plan;

c. O&M Safety Plan; and

d. O&M Quality Management Plan (OMQMP).

5.3. **O&M Safety Plan**

a. As part of the MMP, Developer shall provide an O&M Safety Plan that demonstrates compliance with all State, Federal and local Law, codes and regulations for the protection of personnel and Users during the performance of O&M Work. Developer shall develop a Safety Plan that includes staff training, safety procedures and protocols to address hazardous conditions associated with the O&M Work.

b. Developer is responsible for ensuring that all equipment used shall be maintained in a safe and efficient manner in accordance with all State, local and Federal Law, safety organizations, regulations and guidelines pertaining to providing the required services.

c. Developer shall follow all safety requirements outlined in the National Electric Safety Code (NESC), the Occupational Safety and Health Administration (OSHA) rules, and any applicable standards or practices for safe installation or maintenance of required equipment.

5.4. **O&M Quality Management Plan**

As part of the Maintenance Management Plan, Developer shall provide an O&M Quality Management Plan (OMQMP). The Department will use the OMQMP to monitor Developer's performance of the O&M Work. The OMQMP shall address each of the following:

a. Approach to quality management including a description of quality assurance and quality control functions for validating the information, accuracy, and results of the OMQMP;

b. A quality improvement process used to analyze Nonconforming Work and determine methods or processes to minimize or eliminate Nonconforming Work and Noncompliance Events associated with O&M Work;

c. Approach to reporting relationships and responsibilities including Department oversight;

d. Approach to Developer self-monitoring/self-reporting requirements for inspection, data validation procedures and tracking of Nonconforming Work and Noncompliance Events;

e. Approach to preparing and reviewing Incident reports, non-conformance reports, traffic reports and maintenance work reports;

f. Approach to training of Developer's O&M Work personnel on quality assurance and quality control functions; and

g. A comprehensive records and document management system to provide access to records and to govern protocols for records retention. Developer shall prepare reports that provide summary of observations and identify the results from the OMQMP processes.

6. RENEWAL WORK REQUIREMENTS

6.1. Renewal Work Plan

6.1.1. Developer shall prepare and submit a Renewal Work Plan as part of the MMP that shall be updated annually with the MMP. The Renewal Work Plan shall provide a detailed approach for Renewal Work that includes maintenance, repair, reconstruction, and replacement of each applicable Element, which shall be identified and scheduled in an annual Renewal Work Schedule and a rolling five year Renewal Work Schedule to be updated annually with the MMP. For certainty, Renewal Work does not apply to Elements within or that form part of the Limited O&M Work Segments.

6.1.2. The Renewal Work Plan shall identify Developer's procedure for evaluating the condition of the Project, identification of needs for Renewal Work, the identification and reporting of the status of assets under the control of Developer and Developer's procedures for implementing Renewal Work based on the expected Useful Life of each of the Elements.

6.1.3. The following information shall be provided in the Renewal Work Plan:

a. Developer's overall approach to meeting Renewal Work requirements, and expected Renewal Work expenditure throughout the remainder of the Term;

b. Developer's procedure for optimizing the Useful Life of each Element, describing how the replacement cycle is determined based upon initial cost; maintenance cost; reliability; obsolescence; and other relevant factors;

c. Developer's annual update to the Useful Life Baseline Requirements Table. For each Renewal Element, Developer shall provide evidence based upon actual performance and condition in service, together with appropriate operations and maintenance records, that the Useful Life as set forth in the Useful Life Baseline Requirements Table will be met or exceeded;

d. Developer's procedure for assessing the condition of all Elements, including the critical structural Elements, against intended performance and predicting time to maintenance and Residual Life, including the inspection, testing and monitoring requirements;

e. Demonstration that Developer's approach to Renewal Work is aligned with Good Industry Practice. Developer is required to keep up to date with the latest techniques and research in life cycle maintenance and to demonstrate that all such innovation and research is adopted as warranted in its annual updates of the Renewal Work Plan;

f. Developer's procedure for the selection of suppliers and subcontractors needed to perform Renewal Work, including supply chain management procedures and procedures in place to ensure that quality of work for any Renewal Work is assured;

g. Staffing, organization and specific responsibilities for implementing the requirements for Residual Life Methodology and testing as required by Schedule 12 (*Handback Requirements*);

h. Developer's plan to achieve Handback Requirements for all Elements;

i. The methods and procedures to be used by Developer to estimate the expected cost of Renewal Work for each asset and component, demonstrating that the estimates are reasonable and appropriate; and

j. Planned Closures in order to conduct the Renewal Work, to be updated more frequently as required.

6.1.4. Updates to the Useful Life Baseline Requirements

Developer may submit proposed updates to the Useful Life Baseline Requirements Table to the Department for Approval no later than 90 Calendar Days before the then anticipated Substantial Completion Date, to reflect Good Industry Practice and specific attributes of Developer's final plan set (for example, where the final plan set incorporates a feature that is not included as a Renewal

Element in the Useful Life Baseline Requirements Table), and thereafter no later than 60 Calendar Days before the end of each Contract Year. For each Renewal Element, the Department may take into consideration evidence based upon actual performance and condition in service, together with appropriate operations and maintenance records when considering a request by Developer to increase the Useful Life of any Renewal Element.

6.2. **Annual Renewal Work Schedule**

6.2.1. Not later than 60 Calendar Days before the end of each Contract Year, Developer shall prepare and submit to the Department for Acceptance a detailed annual Renewal Work Schedule for the following year consistent with, and including in respect of such year all information required in accordance with Section 6.3 of this Schedule 11 to be included in, the current five year Renewal Work Schedule.

6.2.2. Developer shall perform the Renewal Work as planned to comply with the applicable General Requirements and meet or exceed the applicable Targets.

6.3. **Five Year Renewal Work Schedule**

6.3.1. Not later than 60 Calendar Days before the end of each Contract Year, Developer shall prepare and submit to the Department for Acceptance a five year Renewal Work Schedule that identifies Developer's rolling five year plan for performing Renewal Work.

6.3.2. Developer shall use the results of all inspections and other relevant information to determine the Residual Life of each Element of the Project to demonstrate how the Handback Requirements will be met. The five year Renewal Work Schedule shall identify any necessary Routine Maintenance to be carried out according to an optimized replacement and renewal cycle such that Renewal Work is performed in accordance with this Section 6.

6.3.3. The five year Renewal Work Schedule shall include by Element:

a. The estimated Residual Life of each Residual Element and the proposed strategy and activities that will be carried out to meet the Handback Requirements;

b. The performance of the Renewal Elements, including any instances where a Renewal Element has not achieved its originally intended Useful Life;

c. A description of any Routine Maintenance required to ensure that each Element of the Project continues to comply with the applicable General Requirements and meet or exceed the applicable Targets;

d. A description of the type of Renewal Work anticipated to be performed at the end of the Element's Residual Life; and

e. A schedule of anticipated planned maintenance needed to perform the Renewal Work including the nature, timing and duration of any associated Closures.

6.4. **General Renewal Work Obligations**

6.4.1. Developer shall perform Renewal Work by no later than the date specified therefor in the relevant Accepted Annual Renewal Work Schedule whenever any one or more of the following conditions applies:

a. Any Element is subject to deterioration that will, or is reasonably likely (as determined in accordance with Good Industry Practice) to, result in imminent or repeated failure to comply with the applicable General Requirements and meet or exceed the applicable Targets;

b. An O&M Defect exists and Renewal Work is needed in order to ensure that Developer complies with its obligations under either of Sections 4.2.2 or 4.2.3 of this Schedule 11;

c. A Category 2 Defect exists and Renewal Work is needed to avoid the O&M Defect from deteriorating to a Category 1 Defect;

d. Any Element ceases to function or dies (as in the case of certain landscaping); and/or

e. The frequency of repair is greater than the frequency of preventative maintenance recommended in the manufacturer's preventive maintenance schedule.

6.4.2. Developer shall perform all Renewal Work in accordance with the provisions of this Agreement relating to the performance of Construction Work that are applicable to the relevant item of Renewal Work, including compliance with associated maintenance of traffic requirements (provided that, for certainty, the provisions of Schedule 6 (*Performance Mechanism*) relating to Non-Permitted Operating Period Closures shall apply and not the provisions thereof relating to Non-Permitted Construction Closures) and the provisions listed in Section 6.4.3 of this Schedule 11 (and otherwise shall comply with all provisions of this Schedule 11 that apply to the performance of the relevant item of Renewal Work).

6.4.3. Such provisions shall include:

a. The terms and procedures set forth in this Agreement that relate to Deliverables in respect of Construction Work;

b. The terms and procedures that relate to performance, design and construction standards in force at the time of the design of the Renewal Work;

c. All quality assurance and quality control provisions set forth in Schedule 8 (*Project Administration*);

d. Developer's obligation to employ an engineer licensed in Colorado to perform specified duties; and

e. The Department's rights to oversee and audit the Renewal Work.

7. MAINTENANCE MANAGEMENT INFORMATION SYSTEM

7.1.1. Developer shall implement a computer-based Maintenance Management Information System (MMIS) to record inventory, failures, repairs, maintenance activities and inspections performed. Developer shall enter all infrastructure Elements into the MMIS with associated identifications (IDs) consistent with those descriptions and units of measure used by the Department. Developer shall record all information in a consistent manner and shall ensure that all information is searchable by individual attribute. The Department shall have read-only remote access to the MMIS. The information contained in the MMIS shall be provided in exportable format to allow pertinent information to be included in the Department's maintenance system.

7.1.2. Developer shall include relevant information in the MMIS including, but not limited to, the following for each and every Element, as appropriate:

a. location, accurate to within one foot in 20 feet

b. equipment nomenclature;

c. serial number;

d. name;

e. date of installation;

f. technician identification;

g. type of failure;

h. date and time of failure;

i. date and time of response to the site;

j. date and time of return to service;

k. preventive maintenance work;

l. scheduled work;

m. work repair code;

n. failure and repair history;

o. statistical data on mean time between failure and mean time to repair; and

p. Closure log by time and location;

7.1.3. Developer shall also keep records of labor hours, expended materials, quantity and equipment types as well as the hours that the equipment was in operation. This information shall be in CDOT component numbers or class code numbers.

7.1.4. Developer shall configure the MMIS to report work by Department function code, infrastructure Element, reference marker, crew and unit of measurement. In the MMIS, the information for bridges shall include National Bridge Inventory (NBI) sheets.

7.2. Geographical Reporting in the MMIS

7.2.1. The MMIS shall be capable of reporting system performance on a geographical basis to demonstrate compliance with operational and maintenance requirements. Within the MMIS, Developer shall incorporate a Geographical Information System (GIS), which shall use the same database engine as the MMIS and shall use the MMIS for display of Element information. All infrastructure Elements shall be identified on the MMIS.

7.2.2. The information displayed geographically shall include pavement condition measurements, maintenance limits, work performed by roadway segment, type of work, crew/contractor, and any other information relevant to the operation, maintenance and renewal of the infrastructure Elements.

7.3. Creation, Updating and Hand Over of the MMIS

7.3.1. Developer shall substantially populate and make fully operational the MMIS prior to the issuance of NTP2. Within 30 Calendar Days after the issuance of NTP2 Developer shall have fully populated the MMIS and thereafter, for the duration of the O&M Period During Construction and the Operating Period, Developer shall keep the MMIS fully populated, updated and operational. Developer shall provide equipment, facilities and training necessary to permit separate remote, real-time, dedicated high-speed access to the MMIS for the Department, where such access shall also be compatible with Department's equipment. Developer shall provide an operating manual ('MMIS Operating Manual') and provide full demonstration of the functionality of the MMIS to the Department for Approval prior to the issuance of NTP2.

7.3.2. When an infrastructure Element is constructed, installed, maintained, inspected, modified, replaced or removed, Developer shall update the MMIS within three Calendar Days of completion of such work. Developer shall record Category 1 Defects and Category 2 Defects on the MMIS within three Calendar Days of them coming to the attention of Developer. Developer shall record all other required information within 15 Calendar Days after completion or occurrence of the relevant activity.

7.3.3. Developer shall hand over the fully populated MMIS and everything required for its operation to the Department, or other entity as directed by the Department, at the Expiry Date (or, if earlier, the Termination Date).

8. INSPECTIONS

8.1. General Requirements

8.1.1. Developer shall carry out inspections and continuous monitoring of all infrastructure Elements in accordance with the MMP. Developer shall use the results of inspections to develop and update the MMP, including the Renewal Work Plan, and to develop programs of maintenance and Renewal Work to minimize the occurrence of O&M Defects and impacts to Users and to ensure that Developer is complying with the applicable General Requirements and meeting or exceeding

the applicable Targets. Developer shall cause trained and competent personnel to plan and implement a program of inspections of all infrastructure Elements which:

a. verifies the continuing safety of the infrastructure Elements for Users;

b. prioritizes Category 1 Defects;

c. identifies Category 2 Defects to be included for repair either within Developer's annually recurring highway maintenance and repair program or as Developer's Renewal Work;

d. is responsive to reports or complaints received;

e. takes account of Incidents and Emergencies affecting the infrastructure Elements;

f. monitors the effects of extreme weather conditions and Precipitation Events; and

g. collects data to monitor performance of infrastructure Elements and to establish priorities for future maintenance operations and Renewal Work.

8.2. **Inspection Frequency**

Developer shall annually review and update as necessary the schedule for inspections which will be appropriately spaced throughout the year. After periods of inclement weather or other events which may cause accelerated deterioration of assets, safety hazards or other detrimental impacts to the infrastructure Elements, Developer shall conduct comprehensive visual surveys which will identify all such areas of concern.

8.3. **General Inspections**

8.3.1. Developer shall perform general routine inspections in accordance with the MMP in order to identify all O&M Defects. Operations and maintenance records in respect of general inspections shall include details of the manner of inspection (e.g. types of Closures), the weather conditions and any other unusual features of the inspection. Developer shall perform general routine inspections such that Category 2 Defects are identified and repaired within the applicable Defect Remedy Period. O&M Defects which require Specialist Inspections to identify them may have different identification periods.

8.3.2. Developer shall use the results of the inspections described in its MMP and other relevant information to determine, on an annual basis, or more frequently, the Useful Life and Residual Life of each applicable Element. Developer shall use this information to update the scope of the Renewal Work Plan.

8.4. **Specialist Inspections**

Developer shall undertake Specialist Inspections for infrastructure Elements listed, at a minimum, in Table 11-1 below and shall include the inspection results as operations and maintenance records.

Table 11-1 – Specialist Inspections

Element	Frequency
Roadway	Annual survey of pavement condition for the I-70 Mainline, CDOT Roadways and Local Agency Roadways within the O&M Limits at the time of the survey and all infrastructure Elements undertaken using automated condition survey equipment to measure all necessary criteria including: ruts, cracking, faulting, skid resistance and ride quality (IRI) according to the inspection and measurement methods set forth in Appendix A-1 and A-2 to this Schedule 11.
Bridges and structures (including	Inspections and load rating calculations at the

Element	Frequency
the Cover)	frequency specified in Appendix A-1 and A-2 to this Schedule 11. In addition, NBIS inspections as per FHWA regulations and at the frequency specified in FHWA regulations, AASHTO Bridge Management, and AASHTO Manual for Condition Evaluation of Bridges. Inspection for the structures and the Cover shall be conducted by certified individuals required by NBIS and NTIS, as applicable. Inspection data shall be updated annually as a minimum.
Lighting, signs, traffic signals and communications equipment, and ITS and ETC facilities,	Inspections as required by FHWA, electrical regulations, equipment manufacturer, all current Department M&S Standard Plans, and this Agreement.
Mechanical, electrical, drainage, and plumbing equipment, including those associated with the Cover	Inspections as required by the MMP, the equipment manufacturer, and this Agreement.

8.5. **Roadway Condition Monitoring**

The Department may conduct a routine annual roadway condition survey as part of the Department statewide annual pavement condition data collection services performed by a contracted service provider. Data collected may include the following:

a. International Roughness Index (IRI) using AASHTO Standard Practices PP50-07, PP49-07, and RR43M/R43-7;

b. Rutting using a 5-laser sensor rut bar in accordance with AASHTO PP38-00;

c. Maximum faulting and average faulting for 1/10-mile segments measured in accordance with AASHTO R36-04; and

d. Cracking Distress in accordance with Distress Identification Manual for Long-term Pavement Management Performance Project (FHWA-RD-03-031). This routine annual pavement condition survey may serve as a quality control check of Developer in order to ensure that Developer is consistently monitoring the pavement condition in accordance with this Agreement.

The Department may conduct additional monitoring at any time in accordance with, and as and when permitted by, the provisions of this Agreement.

9. OPERATIONS MANAGEMENT PLAN

9.1. General

9.1.1. Developer shall prepare the Operations Management Plan (OMP), which shall be consistent with and expand upon the draft OMP submitted with the Proposal, to meet the operating requirements set forth in this Schedule 11 and shall include information regarding the procedures for the O&M Period During Construction and the Operating Period.

9.1.2. Developer shall submit the OMP to, and obtain the Acceptance thereof from, the Department prior to the issuance of NTP2 and shall submit an updated version to the Department for Acceptance by the Department prior to Substantial Completion. In addition, the OMP shall be updated and submitted for Acceptance annually no later than 60 Calendar Days before the end of each Contract Year. The OMP shall also be updated more frequently as required during the Construction Period and the Operating Period to indicate changes to relevant protocols,

agreements, and other interactions with other entities and to indicate requirements for equipment and systems that have been revised, upgraded, or replaced. Developer shall comply with the latest Accepted OMP.

9.2. **OMP Contents**

9.2.1. The OMP submitted (i) prior to the issuance of NTP2, shall include, at a minimum, details of the approach, procedures and means of implementation in respect of the following in respect of both the O&M Work During Construction Period and the Operating Period (except to the extent that any of the following are inapplicable to the relevant period and, where applicable, identifying any differences between such periods) and (ii) prior to Substantial Completion, shall include, at a minimum, such details in respect of the Operating Period (except to the extent that any of the following are inapplicable to such period):

a. Overview description of all facilities, systems and equipment to be operated by Developer;

b. Organizational structure that complies with the requirements of this Schedule 11, including for example a structure that allows 24 hour response to Incidents and Emergencies;

c. Monitoring the safety and operational performance of the Project;

d. Staffing plan procedures, including staff qualifications, training and certification processes;

e. Incident response, management and reporting;

f. Traffic operations restrictions, including permitted Closure hours;

g. Description of how operations performance monitoring will be accomplished;

h. Establishment of plans and procedures in meeting notification and database requirements in compliance with Part 6 (*Reporting Requirements*) of Schedule 6 (*Performance Mechanism*);

i. Operating protocols, agreements and interactions with the various entities and agencies with interests in the Project, including the Tolled Express Lanes;

j. Standard operating and communication procedures for emergency preparation, response, and recovery, including impacts from extreme weather conditions;

k. Planning and coordination with all affected Governmental Authorities, including Emergency Services;

l. Liaison and coordination with the Colorado Traffic Management Center or any other entities that may establish traffic management centers in the area;

m. Analysis of vehicular accident patterns to identify safety issues and implement cost effective solutions to maximize safety;

n. Identification, containment and disposal of Hazardous Substances spills with reports to the Department;

o. Prompt investigation of reports or complaints received from all sources;

p. Establishment of procedures for external communication system messaging resulting in improved dissemination of information and safety notices in reference to, and in compliance with, the requirements of Schedule 14 (*Strategic Communications*);

q. Establishment of guidelines and procedures for handling system failures and ensuring that all failures are properly documented;

r. Staff qualifications, equipment availability, response and cleanup as a result of fuel spills or other contamination-causing events; and

s. Description of staff training on the National Traffic Incident Management Responder Training Course by FHWA.

9.2.2. The OMP shall include the following appended Plans:

a. Snow and Ice Control Plan;

b. Incident Response Plan; and

c. Courtesy Patrol Service Plan, which shall provide an overview and establish procedures for the Courtesy Patrol Services as described in Section 10 of this Schedule 11;

9.3. **Snow and Ice Control Plan**

9.3.1. Developer shall submit a Snow and Ice Control Plan as part of the OMP. The Snow and Ice Control Plan and subsequent updates shall address requirements for the operations, management, proposed equipment, maintenance yards, materials, staffing and all other items necessary to comply with the applicable General Requirements and meet or exceed the applicable Targets related to Snow and Ice Control Services. An annual update to the Snow and Ice Control Plan shall be submitted by September 1 of each year for Acceptance by the Department.

9.3.2. The Snow and Ice Control Plan shall outline procedures that will be implemented to maintain the I-70 Mainline, and other infrastructure Elements and portions of the CDOT Roadways (in each case) as identified in the O&M Limits Reference Drawings, free from snow and ice to comply with the applicable General Requirements and meet or exceed the applicable Targets including location of maintenance yards, procedures for snow and ice clearance plans to maintain traffic flows during and after a Precipitation Event, procedure for sourcing and analysis of weather information, procedures for meeting response times, procedures for meeting treatment and sweeping requirements to counteract ice and snow accumulation, procedures for techniques to be adopted on all lane types including Tolled Express Lanes and General Purpose Lanes.

9.3.3. The Snow and Ice Control Plan and all updates shall at a minimum include details of the following:

a. Management and administration;

b. Safety approach and compliance with O&M Safety Plan;

c. Quality approach and compliance with O&M Quality Management Plan;

d. Description of facilities that will be used for staging, including locations;

e. Approach to monitoring and oversight;

f. Frequency of monitoring patrols during and between Precipitation Events;

g. Weather forecasting systems, processes and procedures;

h. Equipment, number, size and type;

i. Materials and chemicals to be used;

j. Description of Snow Routes and route analysis to support the equipment and resources required, including the following information:

i. Cycle time (time it takes to complete route);

ii. Individual maps in a size and format that is legible, including photographs if necessary, clearly showing each winter vehicle route with clear route identification numbers. The colored maps shall be in native file and PDF format, and of sufficient scale that the starting and ending points are clear. Locations of features affecting the route description, including multiple lanes, ramp configurations, channelizations, Tolled Express Lanes, dead heading,

turnarounds and other special features that may affect plowing and/ or material spreading times shall be shown; and

iii. Summary map in a size and format that is legible, including photographs if necessary, with all routes clearly labeled on one map.

k. Description of patrol size and philosophy of plowing including shift and shift change times;

l. Call out procedures including personnel, contact lists;

m. Details on how response times will be addressed;

n. Application procedures for liquid and/or solid de-icers and anti-icers;

o. Calibration of Spreaders and liquid de-icer and anti-icer equipment;

p. Staff training plan;

q. Precipitation Event reporting and documentation;

r. Procedure for post-Precipitation Event clean-up work, including stockpiling of excess snow, which shall not be stored in the clear zone;

s. Procedure for sweeping;

t. Procedure for meeting Denver Regional Council of Government's air quality requirements after Precipitation Events; and

u. Procedure for reporting including results with respect to Performance Requirements, and pre- and post- event meetings.

9.4. **Incident Response Plan**

Developer shall submit an Incident Response Plan ("IRP") as part of the OMP that is consistent, and demonstrates how Developer will comply, with Incident management requirements of relevant Governmental Authorities. In the IRP, Developer shall address as a minimum:

a. description of Developer's specific responses to Incidents;

b. the responsibility to prepare, and turnaround time for the preparation of, monthly Incident reports in electronic format (and as further specified in this Schedule 11) and submission of them to the Department when Incidents occur;

c. all issues associated with Hazardous Substances spills; and

d. necessary coordination responsibilities with the Department and relevant Governmental Authority and Emergency Services personnel when Incidents occur.

10. COURTESY PATROL REQUIREMENTS

10.1. **Patrols**

10.1.1. For the duration of the O&M Period During Construction and the Operating Period, Developer shall provide Courtesy Patrol Services service for the Project as described in this Section 10 and in Appendix B to this Schedule 11. The purpose of the service is to reduce congestion and potential safety risks on the Project by:

a. Continuously patrolling within the Project during peak and non-peak traffic hours and weekends;

b. Providing towing and motorist assistance services;

c. Providing towing services for the Tolled Express Lane(s) and General Purpose Lane(s);

d. Providing on-call severe weather emergency or planned Special Event towing services; and

e. Quickly locating, assisting, and/or removing any disabled vehicles thereon as soon as possible.

10.1.2. Categories of Service

a. Developer shall provide five general categories of service, as follows:

i. To locate a disabled vehicle on the shoulder of the highway segment and, at the motorist's election, to move the vehicle to an appropriate Drop Site and there to provide the limited assistance available to Developer (i.e. flat tire, out of gas, etc.) if such assistance will make the vehicle operational;

ii. To locate a disabled vehicle in traffic on the highway segment and, at the motorist's election, to move the vehicle either to the shoulder of the highway segment or to an appropriate drop site, and there to provide the limited assistance available to Developer if such assistance will make the vehicle operational;

iii. To assist motorists, and Local Agencies or Emergency Services as requested, concerning an accident or other emergency on the highway segment. Such assistance includes, without limitation, towing or pushing vehicles as directed, protecting the scene of an accident, cleaning up debris caused by an accident, and calling and assisting local law enforcement in the event of an accident;

iv. To pick up light debris on roadway; and

v. Data collection communication to the Department.

11. SNOW AND ICE CONTROL SERVICES

11.1. Subject to Developer's obligations to perform Snow and Ice Control Services in accordance with Section 2.2.2.b and Section 3.2.2.d of this Schedule 11, Developer shall provide Snow and Ice Control Services on the I-70 Mainline, and other infrastructure and portions of the CDOT Roadways (in each case) as identified in the O&M Limits Reference Drawings, commencing on and from the Snow and Ice Control Commencement Date for the remainder of the O&M Period During Construction and the Operating Period in accordance with the requirements in this Schedule 11, including Appendix A-1 and Appendix A-2 to this Schedule 11.

11.2. Developer shall achieve a Level of Service 'A' with respect to all snow and ice control "survey items" as identified in CDOT's Maintenance Levels of Service Manual, including condition 1 with respect to "snow removal's road condition" requirement in the manual.

11.3. Developer is required to use all available resources to assess weather conditions and make decisions and direct actions that maintain the travel ways as safe as possible during and after the occurrence of any Precipitation Event that causes the roadway or any portion of the Project to accumulate snow and/or ice. Developer shall use all available resources to maintain safety on the travel ways and for ensuring that all Developer staff are aware of the relevant requirements specified in Appendix A to this Schedule 11. The Snow and Ice Control Services include, but are not limited to, loading materials on trucks, snow plowing and the application of liquid and solid de-icers and anti-icers within the O&M Limits.

11.4. Developer shall also be responsible for all clean up following the occurrence of a Precipitation Event including touch up work to remove snow that could cause freeze-thaw or traffic hazards and sweeping as required by the Denver Regional Council of Governments. Developer shall place necessary Snow and Ice Control Equipment in service and react to changing weather and roadway conditions as quickly as possible, and at a minimum shall meet the response times specified in Appendix A-1 and A-2 to this Schedule 11.

11.5. Developer shall take all necessary actions to achieve the following.

a. Provide all Snow and Ice Control Services.

b. Provide all facilities, equipment, and resources necessary for the performance of the Snow and Ice Control Services.

c. Minimize delay and inconvenience to Users as a result of the occurrence of any Precipitation Event.

d. Identify all O&M Defects and damage which are caused by any Precipitation Event or Developer causes in the provision of the Snow and Ice Control Services and correct all such O&M Defects and damage.

e. Monitor and observe weather and weather forecasts to proactively deploy resources to minimize delays and safety hazards due to Precipitation Events.

f. Minimize the risk of damage, disturbance or destruction of third party property during the provision of the Snow and Ice Control Services.

g. Coordinate with the Department and Local Agencies with statutory duties or functions in relation to the Snow and Ice Control Services. Coordination shall include interface, edge areas, and boundaries between Developer, the Department, and the Local Agency to ensure the Site and adjacent vicinity is covered. This includes facilitating meetings with all stakeholders prior to each winter season for such coordination, and after each winter season for debriefing, and shall include documenting the conclusions of such coordination. Such meetings shall occur annually at a minimum and more frequently as required or as requested by the Department or Local Agency.

h. Provide all necessary post-Precipitation Event sweeping.

i. Provide oversight and inspection to assure that the Snow and Ice Control Services are being conducted in accordance with the provisions of the Snow and Ice Control Plan and in accordance with the O&M Safety Plan.

j. Actively participate in meetings scheduled by the Department to plan for all forecast Precipitation Events and for debriefing after all Precipitation Events.

11.6. Snow and Ice Control Equipment

11.6.1. Developer shall determine the equipment (the "Snow and Ice Control Equipment") including service vehicles, loaders and trucks that it requires to provide the Snow and Ice Control Services to comply with the requirements of this Section 11 of Schedule 11, and to comply with the applicable General Requirements and meet or exceed the applicable Targets. The Snow and Ice Control Equipment required by Developer shall be determined based on an annually reviewed or updated route analysis conducted by Developer, and in accordance with Good Industry Practice. The Snow and Ice Control Equipment shall also include such equipment as is expressly required by this Schedule 11.

11.6.2. Each item of Snow and Ice Control Equipment used by Developer in the provision of the Snow and Ice Services shall have the necessary valid registrations, permits, licenses, insurance and certifications, and shall include warning light system to signify snow and ice operations. Developer shall maintain each item of Snow and Ice Control Equipment to the minimum standard established by commercial vehicle inspection as enforced by the Colorado State Patrol Motor Carrier Safety Section, which is charged with ensuring the safe operation of all commercial vehicles and operators within the State, and the Federal Motor Carrier Safety Regulations which apply in the State of Colorado.

11.6.3. If any item of Snow and Ice Control Equipment is not in a safe condition, then it shall be removed from the worksite and immediately replaced with an item of Snow and Ice Control Equipment that meets all requirements of this Section 11. Any such item of Snow and Ice Control Equipment shall not be returned to service until the necessary repairs or modifications have been made.

11.6.4. Each item of Snow and Ice Control Equipment used by Developer shall bear the name of Developer and shall be assigned a unique number that is prominently displayed on either side of the Snow and Ice Control Equipment while in use.

11.6.5. Developer shall equip all winter operations spreading equipment with on board electronic Spreader control system designed to control the application of highway de-icing chemicals.

a. The system shall consist of: a programmable microprocessor control console, with light emitting diode (LED), vacuum fluorescent display (VFD), or liquid crystal display (LCD) that are easy to read during both day and night operation. The controller shall display to the Spreader operator, application rate settings, gate setting, spinner speed setting, material selected - both granular and liquid, and shall indicate errors. The system operating mode shall indicate manual or automatic. The system shall include a means to transfer data to an Automated Vehicle Locator (AVL) system. The discharge of de-icing material shall be controlled proportional to road speed at the pre-programmed application rates.

b. The Spreader control system shall incorporate a data collection system that records all specified data for each event during an operation. A new event occurs every time that the system power is turned on or off, the application rate is changed, material selection is changed, data is downloaded, the operating mode changes, incorrect gate setting, or insufficient material detected.

c. The data collected per event shall include, Truck Number, Event Start Date, Event Start Time, 24 hour clock (HH:MM), Material Type Solid, Spinner Mode (Single or Dual), Spread Rate (lbs/mi), Total Distance (mi), Spread Distance (mi), Spread Quantity (lbs), Blast Distance (mi), Blast Quantity (lbs), Event Type, Material Type Liquid, Pre-wet Liquid Rate (%) and Pre-wet Volume (gal).

d. The system shall have sufficient memory to store a minimum of 100 events per category before downloading is required.

11.6.6. Developer shall equip all winter operations spreading, plowing and anti- icing equipment including patrol vehicles with digital infrared temperature indicating system for both road surface and ambient temperatures, suitable for vehicle mounting and operation. The sensor shall accurately sense road surface and ambient temperatures in all weather conditions and will be capable of

taking samples at a minimum of 10 times/second, while the vehicle is not moving or in full motion, to provide "real time" temperature readings. The system accuracy will be +/-1.0°F@32°F, in all operating ambient temperatures from -40°F to 150°F.

11.7. Snow and Ice Removal Restrictions

Snow and Ice Control Services performed in any lanes closed to traffic and behind all temporary barriers shall be done in a way to avoid placing snow back into open lanes of traffic. Snow shall be removed far enough from the edge of travel lanes that runoff from melting snow will not enter into the travel lanes. Developer shall not create windrows or snow piles that may block ramps, intersections or adjoining Local Agency Roadways nor shall Developer leave any windrow or snow piles that may become hazards after a Precipitation Event. Developer shall not cast snow onto any roads beneath bridges or onto any roads adjacent to the I-70 Mainline when snowplowing or working on bridges or overpasses. Developer shall not cast snow onto private property, nor cast snow in a way that would cause damage to that property. Notwithstanding other reporting or monitoring requirements identified in this Schedule 11, Developer shall additionally be required to self-report using forms that contain at least the minimum information required by Appendix C to this Schedule 11.

11.8. De-icing and Anti-icing Chemicals

All de-icing and anti-icing chemical materials introduced into the Environment by Developer shall meet or exceed Pacific Northwest Snow Fighters (PNS) criteria, and materials used shall be materials identified on the PNS approved products list, which such materials shall not have any known adverse reactions when used with CDOT anti-icing and de-icing materials. All de-icing and anti-icing chemical materials introduced into the Environment by the Developer shall also conform to the requirements of the Colorado Department of Public Health and Environment, Air Quality Control Commission's Regulation 16.

11.9. Winter Operations Environmental Training

Winter operations staff training shall include environmental compliance requirements. All applicable environmental topics shall be covered including water quality regulations, air quality regulations, and compliance procedures.

12. AUTOMATED VEHICLE LOCATOR

12.1. AVL Requirements

a. Developer shall install and maintain an automated vehicle locator (AVL) system for vehicles used on the Project to perform O&M Work on the Site, including but not limited to:

i. Winter vehicles, such as vehicles equipped for spreading winter materials of any kind, vehicles equipped for plowing with one-way plow, reversible plow, plow and/or wing plow, tow plow or any combination thereof;

ii. Patrol vehicles, such as Courtesy Patrol Service vehicles, and vehicles such as pick-up trucks and cars used in roadway patrol and project supervision; and

iii. Other vehicles for O&M Work, such as dump trucks, flatbed trucks, crew cabs, pavement marking vehicles, crash trucks, electrical maintenance vehicles, Incident response vehicles, and sweepers;

b. AVL is not required on equipment used for Renewal Work.

c. The system shall track, store, display (on a state highway base map) and report movements and actions, in real-time, with instant live replay every 10 to 12 seconds while in use, 24 hours a day, seven days a week. The system's data shall all be accessible by the Department in real-time and be compatible with Department's system. The system shall transmit data even when the vehicle is turned off. The on-board AVL/GPS unit shall allow for data to be stored when there is no wireless network present, and then uploaded

once network service is re-gained. The on-board unit's software shall continuously run tests to determine whether or not network coverage exists prior to transmitting data, to ensure there will be no data loss. If a loss of coverage is detected, the unit shall immediately begin to store the data within the on-board memory allocated to this application.

d. The system shall be capable to read and transmit all data captured by the electronic Spreader control units in all Spreaders, Tow Plow Spreaders and/or plow Spreader combination units and digital infrared temperature indicating system.

13. REPORTING AND LIAISON

13.1. Monthly Operations and Maintenance Reporting Requirements

13.1.1. During the O&M Period During Construction and the Operating Period, Developer shall report on all of the monthly O&M Work activities performed during the previous month and the planned activities for the upcoming month ("Monthly O&M Report"). Monthly O&M Reports shall be submitted to the Department for Acceptance no later than the 10th Working Day of each month, with the first such report to be submitted in the month following the month in which NTP2 is issued.

13.1.2. The Monthly O&M Reports shall contain at minimum the following information with respect to maintenance activities:

a. A summary of planned O&M Work activities for the month during which the report is submitted and the following month;

b. A summary of the O&M Work performed and completed for the previous month;

c. A summary of the planned maintenance that was not completed for the previous month, including the reasons for the non-completion and a summary of deferred days for each deferred item;

d. Summary of the maintenance activities and results performed for the previous month beyond the planned maintenance activities for that month;

e. Developer's Incident response logs related to maintenance activities, including a time-based report of all actions and activities performed by Developer including a description of any damages including the date, infrastructure component, details of the resulting Category 1 Defect or Category 2 Defect or damage;

f. Detailed results of all inspections, assessments and testing activities, including the related procedures and forms; and

g. Preventative maintenance plan and progress.

13.1.3. The Monthly O&M Reports shall contain at minimum the following information with respect to operations activities:

a. Monthly Incident reports: For any Incidents that in the previous month result in damage to any Elements or require response of Emergency Services. The report shall be created identifying the nature of the Incident, time, date, location, parties involved, and actions taken. For Incidents involving fatalities, Developer shall submit the Incident report to the Department within 24 hours of the Incident;

b. Reports on O&M Defects: For each O&M Defect in an Element identified in the previous month, the report shall identify the location, nature, and cause of the O&M Defect and the steps that will be, or have been, taken by Developer to address the O&M Defect;

c. Summary of conformance with OMQMP in the previous month;

d. Environmental monitoring activities, including the requirements specified in Schedule 17 (*Environmental Requirements*), and any permitting activities, performed in the previous month;

e. Snow and Ice Control Services performed in the previous month; and

f. Courtesy Patrol Services activities in the previous month.

13.1.4. Developer shall report on other data that are tracked in the MMIS, the AVL system, or other relevant information, as may be reasonably requested by the Department.

13.2. **Annual Operations and Maintenance Reporting**

13.2.1. The annual report ("Annual O&M Report") shall be submitted no later than 30 Calendar Days after the end of each Contract Year to the Department for Acceptance, and shall contain at minimum the following information:

a. An overall summary of the performance for the year including quality, safety, environmental aspects;

b. A summary of the planned maintenance and operations activities for the Contract Year in which the report is submitted;

c. A summary of the maintenance and operations activities performed and completed for the year along with the results;

d. A summary of the Renewal Work that was performed, including the type of work performed and the dates of commencement and completion of the work. As-Built drawings associated with Renewal Work shall also be provided;

e. A summary of the planned activities that were not completed for the year, including the reasons for the incompletion and a summary of deferred days for each deferred item;

f. Summary of the maintenance and operations activities performed for the year beyond the planned activities for that year;

g. Summary of Noncompliance Points accrued including details of each Noncompliance Event;

h. Summary of Non-Permitted Closures including details of each Non-Permitted Closure;

i. Developer's Incident response logs including a time-based report of all actions and activities performed by Developer;

j. Results of all inspections (including specialist inspections), assessments and testing activities, including any update of asset condition inventory;

k. Preventative maintenance plans and progress; and

l. Other data that are tracked in the MMIS, the AVL system, and other information as may be reasonably requested by the Department.

13.3. **Project Meetings**

13.3.1. Developer shall schedule, prepare an agenda, and facilitate monthly meetings, or as needed, with the Department representatives to discuss the O&M Work and to review O&M Work status including the reports required in this Schedule 11. The items to be discussed shall include, but not be limited to: O&M Work in the previous month, planned O&M Work for the following month, public information and User issues, future Closures, Incidents and Emergencies, Incident management coordination, accrual of Noncompliance Points, Construction Closure Deductions and Operating Period Closure Deductions, and any other pertinent information related to the O&M Work. The Department may wish to hold separate meetings for general management/operations and maintenance as required.

13.3.2. The Department may request a meeting at any time to discuss O&M Work-related issues and accidents. In addition, Developer shall coordinate meetings to be held at least one week prior to planned Closures. Developer shall be required to actively participate in toll system meetings, major work meetings, meetings to plan for all forecast Precipitation Events and for debriefings after all Precipitation Events, planning meetings and others as directed by the Department, and shall provide assistance, information, and expertise as needed.

13.3.3. Developer shall conduct Incident debriefings to review lessons learned and best practices. These Incident debriefings shall be summarized at subsequent meetings. Developer shall be required to attend quarterly meetings with the Department to review any safety and traffic operations issues or requests related to the O&M Work of any Elements.

13.3.4. Section 9.1 of Schedule 8 (*Project Administration*) shall apply to the preparation of minutes for all meetings held pursuant to this Section 13.3.

13.4. **Project Liaison**

13.4.1. Developer shall liaise with the Department and other Governmental Authorities, companies including Utilities and adjoining jurisdictions to ensure that planned maintenance and other proposed Closures do not conflict with closures on adjacent facilities or Governmental Approvals or Permits granted for right of access or special hauling.

13.4.2. Developer shall liaise with the Department to keep informed of Governmental Approvals or Permits granted for the Project.

13.4.3. Developer shall provide the Department with one point-of-contact, Developer's Representative, as a member of Developer's Key Personnel with authority to coordinate all O&M Work. The Department will require contact details for the primary, secondary and back-up contacts that are knowledgeable with the O&M Work and have decision making authority.

13.5. **Annual Review of O&M Work**

13.5.1. The Department will meet with Developer to discuss any potential impacts to the O&M Work, including those that may result from the occurrences below as well as any changes which may be required to the MMP and OMP:

a. A change to statewide maintenance programs or practices;

b. A change to any of the policies, procedures, standards, manuals, handbooks, guides, specifications, or any other State, local, or federal documents used to monitor the performance of the O&M Work;

c. Increased maintenance due to the construction of roadways, structures, and facilities not included in the Department's work program at the time of execution of this Agreement;

d. Increased maintenance due to the transfer of ownership to the Department of non-state roadways, structures, and facilities within the O&M Limits; and

e. Additional requirements as a result of traffic operational improvements.

14. DELIVERABLES

14.1. Deliverable Requirements

At a minimum, Developer shall submit the following to the Department for Information, Acceptance, and/or Approval in accordance with the timeframes specified.

Deliverable	Information, Acceptance, Approval	Schedule
O&M Limits During Construction Drawings; and subsequent updates	Acceptance	Prior to the issuance of NTP2; Updated as required
Baseline Asset Condition Inspection Plan	Acceptance	Prior to the issuance of NTP2
Baseline Asset Condition Report	Acceptance	Prior to the issuance of NTP2
O&M Limits After Construction Drawings; and subsequent updates	Acceptance	Prior to Substantial Completion; Updated as required
MS4 permit annual reporting	Acceptance	December 31 of each Calendar Year
Cover Top O&M Manual	Approval	Prior to Substantial Completion
ITS personnel in accordance with Section 3.2.8.c. of this Schedule 11	Approval	Prior to Substantial Completion
Updates to Performance and Measurement Table in Appendix A-2	Approval	90 Calendar Days before the anticipated Substantial Completion Date; no later than 60 Calendar Days before the end of each Contract Year
Maintenance Management Plan (MMP), including Plans forming the MMP	Acceptance	Prior to the issuance of NTP2, and updated version prior to Substantial Completion; 60 Calendar Days before the end of each Contract Year; or more frequently as required
Operations Management Plan (OMP), including Plans forming the OMP	Acceptance	Prior to the issuance of NTP2, and updated version prior to Substantial Completion; 60 Calendar Days before the end of each Contract Year; or more frequently as required

Deliverable	Information, Acceptance, Approval	Schedule
Snow and Ice Control Plan	Acceptance	Same schedule as the OMP; and annual updates by September 1 of each year
Monthly O&M Report	Acceptance	No later than 10th Working Day of each month commencing the month following the issuance of NTP2
Annual O&M Report	Acceptance	30 Calendar Days after the end of each Contract Year
Maintenance Management Information System (MMIS) Operating Manual, and demonstrated functionality	Approval	Prior to the issuance of NTP2
Updates to Useful Life Baseline Requirements Table	Approval	90 Calendar Days before the anticipated Substantial Completion Date; and no later than 60 Calendar Days before the end of each Contract Year thereafter
Annual Renewal Work Schedule	Acceptance	Not later than 60 Calendar Days before the end of each Contract Year
Five Year Renewal Work Schedule	Acceptance	Not later than 60 Calendar Days before the end of each Contract Year

15. APPENDICES

Appendix A-1 Performance and Measurement Criteria During Construction

Appendix A-2 Performance and Measurement Criteria After Construction

Appendix B Courtesy Patrol Requirements

Appendix C I-70 East Snow Removal Survey

Appendix D O&M Work Responsibility for Structures

Appendix A-1 – Performance and Measurement Criteria During Construction

Unless stated otherwise, Measurement Criteria for pavement related Performance Requirements shall be measured using procedures, techniques and measuring equipment consistent with the Colorado DOT Distress Manual for HMA and PCC Pavements by National Center for Pavement Preservation, Appendix B of the Development of a Pavement Preventative Maintenance Program for the Colorado Department of Transportation, Report No. CDOT-DTD-R- 2004-17 Final Report.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
1.	**PAVEMENT (ROADWAY, RAMPS, ACCESS ROADS AND OTHER PAVED AREAS)**					
1.1	I-70 Mainline, CDOT Roadways, and Local Agency Roadways and connecting structures	Elements to be free from obstructions and debris.	1 hr	N/A	Visual Inspection	No obstructions or debris noted by visual inspection.
1.2	Pavement - All roadways, including ramps, detours, and shoulders (mainline including the bridge deck, covers, gratings, frames, expansion joints and boxes)	Smooth and quiet surface course with adequate skid resistance and free from Defects.	2 hrs	12 mo.	**a) Localized deficiencies -** Physical measurement. **b) Faulting** **c) Lane to lane, and lane to shoulder drop-off -** Physical measurement **d) Instances of pavement failures-** Visual Inspection of roadway surfacing **e) Edge drop-offs** Physical measurement of edge drop-off level to adjacent surface	Maintain or exceed condition as identified in the BACR. Maintain or exceed condition as identified in the BACR. No instances of drop-off greater than 1.0 inch. No instances of failure, including potholes, greater than 1.0 sq-ft and 1.5 inch in depth. No instances of base failures, punch-out's and jointed concrete pavement failures. Maintained roadway (including shoulder) free from instances greater than 2".

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
1.3	Pavement - All roadways, including ramps, detours, and shoulders (mainline including the bridge deck, covers, gratings, frames, expansion joints and boxes)	Removal of deleterious material and repair of damaged pavement.	12 hrs	N/A.	Oil, antifreeze, gasoline or other liquids spilled from vehicles onto traffic lanes is removed from the roadway.	Incident logs and maintenance records demonstrate scheduled inspections and clean up times.
1.4	Crossovers, access roads and other paved areas	Elements are free of Defects.	12 hrs	12 mo.	Measurement of potholes and base failures.	No instances of potholes or base failures.
1.5	Curbs	Maintain or exceed the condition as identified in the BACR.	7 days	N/A	Visual inspection	Maintain or exceed condition as identified in the BACR.
1.6	Hard Capped Surface	Free of Defects and removal of deleterious material.	24 hrs	6 mo.	Visual inspection	No instances of material tracking onto pavements or presence of weeds/grass.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
2.	**DRAINAGE SYSTEMS**					
2.1	Storm Sewer Systems (conduit, catch basins, inlets, manholes, outfalls), including adjacent drainage conduit extending from an existing drainage structure to the next downstream existing drainage structure	Each element of the drainage system is maintained to ensure it functions correctly from the point at which water drains to the outfall or drainage way.	2 hrs	N/A	Compliance with the CDOT Level of Service Manual (Drainage Inlets and Structures). Measurement of clogging of pipes, conduits, catch basins, inlets, or outfalls.	Maintain or exceed condition as identified in the BACR.
2.2	Open Water Carriers (standard roadside ditches, median ditches, relocated channels, channel linings)	Each Element of the drainage system is maintained to ensure it functions correctly.	24 hrs	N/A	Visual inspection and all elements rated in accordance with the CDOT Level of Service Manual (Drainage Ditches).	Maintain or exceed condition as identified in the BACR. No instances of: Undermining, undercutting, erosion, or obstructions impeding the flow of water

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
2.3	Pavement Drainage (trench drains, slotted drains, gutters, catch basins, inlets, outlets)	Each element of the drainage system is maintained to ensure that it functions correctly.	2 hrs	N/A	Measurement of standing water within the I-70 Mainline and on paved surfaces.	Maintain or exceed condition as identified in the BACR.
2.4	Culverts	Culvert is maintained and functions correctly, joints remain soil tight and erosion controlled.	2 hrs	N/A.	Culvert condition and functionality.	Culvert functioning as designed.
2.5	End Treatments (Headwalls, precast reinforced concrete outlets, concrete apron)	Elements are maintained and function correctly.	24 hrs	N/A	Visual inspection of erosion, undercutting, scour, cracked, spalled, or broken concrete.	Maintain or exceed condition as identified in the BACR.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
2.6	Storm water systems	Storm water systems installed as permanent features maintained, functioning correctly, and operating as designed.	24 hrs	N/A	Compliance with regulations and standards and in accordance with CDOT's Erosion Control and Storm Water Quality Guide (ECSQG). **Manufactured Systems:** Compliance with manufacturers manuals **Vegetated Biofilters/Filter Strips:** Inspection of slopes and ditch bottom; vegetation management; debris and litter management. **Detention Ponds:** Inspected and checked for compliance with management plan. **Bioretention Cell, Infiltration:** Inspected for excessive ponding; overgrown vegetation, litter/debris; erosion and deposition; and outlet structure clogging **Infiltration Basin/Trenches:** Inspected for debris, overgrown vegetation, level of sedimentation; and condition of observation wells. **Constructed Wetlands:** Effectiveness of vegetation management; absence of erosion, clogging; litter/debris and sediment.	Operate as designed and no instances of non-compliance with regulations and standards and ECSQG. Operate as designed and routine clean-out, removed material sampled and tested in line with manufacturers manuals Filters performing as designed. All systems operate as designed and no instances of excessive ponding, threats to structural soundness of embankments and outlet structures; excessive erosion and sediment, seepage from embankments, overgrown vegetation, outlet clogging or litter/debris.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
2.7	Discharge systems	Surface water discharge systems perform their proper function and discharge to groundwater and waterways complies with the relevant regulations and permits.	24 hrs	N/A	Compliance with regulations and in accordance with CDOT's Erosion Control and Storm Water Quality Guide.	No instances of non-compliance.
3.	**STRUCTURES**					
3.1	Structures having an opening measured along the center of the roadway of more than 20 feet between under copings of abutments or springlines of arches or extreme ends of openings or multiple boxes.	Substructures and superstructures are free of: • undesirable vegetation • debris and bird droppings • blocked drains, weep pipes manholes and chambers • blocked drainage holes in structural components • Defects in joint sealants • Defects in pedestrian protection measure • scour damage • corrosion of rebar • paint system failures • impact damage Bridge structures maintain a minimum vertical clearance of 16.5 feet over traveled lanes. Maintain structures to specified condition rating.	24 hrs	6 mo.	Inspection and assessment in accordance with the requirements of federal National Bridge Inspection Standards (NBIS) of the Code of Federal Regulations, 23 Highways – Part 650, the current version of the CDOT Pontis Bridge Inspection Coding Guide and AASHTO Manual for Bridge Evaluation, the FHWA Bridge Inspector Reference Manual, AASHTO Manual for Bridge Element Inspection, and Recording and Coding Guide for the Structural Inventory and Appraisal of the Nation's Bridges.	Records as required in the current version of the CDOT Pontis Bridge Inspection Coding Guide and AASHTO Manual for Bridge Evaluation. No occurrence of NBI and Pontis condition rating below the BACR condition.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
3.2	Structure component	i) Expansion joints are free of: • dirt debris and vegetation • Defects in drainage systems • loose nuts and bolts • Defects in gaskets • leaking ii) The deck drainage system is free of all and operates as intended. iii) Barriers are free of: • loose nuts or bolts • blockages of hollow section drain holes • vegetation • accident damage iv) Bearings and bearing shelves are clean.	24 hrs	6 mo.	Inspection and assessment in accordance with the requirements of federal National Bridge Inspection Standards (NBIS) of the Code of Federal Regulations, 23 Highways – Part 650, the current version of the CDOT Pontis Bridge Inspection Coding Guide and AASHTO Manual for Bridge Evaluation, the FHWA Bridge Inspector Reference Manual, AASHTO Manual for Bridge Element Inspection, and Recording and Coding Guide for the Structural Inventory and Appraisal of the Nation's Bridges.	Records as required in the current version of the CDOT Pontis Bridge Inspection Coding Guide and AASHTO Manual for Bridge Evaluation. No occurrences of NBI and Pontis condition rating below the BACR condition.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
3.2 (cont.)	Structure component (continued)	v) Sliding and roller surfaces are clean and greased to ensure satisfactory performance. Additional advice contained in bearing manufacturers' instructions, in the Current CDOT M&S Standard Plans, Standard Specification for Road and Bridge Construction is followed. Special finishes are clean and perform to the appropriate standards. vi) All non-structural items such as hoists and electrical fixings, operate correctly, are clean and lubricated as appropriate, in accordance with the manufacturer's recommendations and certification of lifting devices are maintained. vii) Maintain structures to specified condition rating.				Maintain or exceed condition as identified in the BACR.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
3.3	Structures (general) – including existing viaduct.	Safe operation of structures, maintained to prevent safety issues arising	1 hr	12 months	Inspection of surfaces adjacent to and above the Roadway, and all structural components.	No instances of delaminated concrete above the Roadway. Maintain or exceed condition as identified in the BACR.
3.4	Non-bridge class culverts	Non-bridge-class culverts are free of: • vegetation and debris and silt • Defects in sealant to movement joints • scour damage	24 hrs	6 months	Inspection and assessment in accordance with the requirements of federal National Bridge Inspection Standards (NBIS) of the Code of Federal Regulations, 23 Highways – Part 650, the current version of the CDOT Pontis Bridge Inspection Coding Guide and AASHTO Manual for Bridge Evaluation, the FHWA Bridge Inspector Reference Manual, AASHTO Manual for Bridge Element Inspection, and Recording and Coding Guide for the Structural Inventory and Appraisal of the Nation's Bridges.	Records as required in the current version of the CDOT Pontis Bridge Inspection Coding Guide and AASHTO Manual for Bridge Evaluation. No occurrences of NBI and Pontis condition rating below the BACR condition. Vegetation, debris and silt levels to be at or lower than that identified in the BACR. None with Defects in sealant and movement joints. None with scour damage.
3.5	Retaining walls	Maintain retaining walls free of vertical, lateral or rotational movement with no material Defects compromising the intended performance.	24 hrs	6 months	Physical Measurement and Inspections.	Maintain or exceed condition as identified in the BACR.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
3.6	Sign structures	Sign gantries and foundations are structurally sound and free of: loose nuts and bolts, Defects in surface protection systems	24 hrs	6 months	Inspection and assessment in accordance with the requirements of CDOT Recording and Coding Guide for the Inventory and Inspection of Colorado's Overhead Signs, Signals and High Mast Lights and CDOT M&S Standard Plans.	Maintain or exceed all Pontis condition states as identified in the BACR. None with loose assemblies. None with Defects in surface protection.
3.7	Load ratings	All structures maintain the design load capacity	24 hrs	6 months	Load rating calculations in accordance with the AASHTO Manual for Bridge Evaluation, the current version of the CDOT Pontis Bridge Inspection Coding, and CDOT Bridge Rating Manual. Load restriction requirements as per AASHTO Manual for Bridge Evaluation, the current version of the CDOT Pontis Bridge Inspection Coding, and CDOT Bridge Rating Manual.	Comply with load restrictions on new structures for Colorado legal loads (including legally permitted vehicles)

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
4.	**ROADWAY MARKING**					
4.1	Pavement markings – General (temporary and permanent)	Pavement markings are: • clean and visible during the day and at night • whole and complete and of the correct color, type, width and length • correctly placed to meet the MUTCD and CDOT M&S Standard Plans. Non-applicable pavement markings are removed.	24 hrs	1 mo.	Compliance with regulations Using a calibrated retro-reflectometer, in conformance with ASTM E 1710 or AASHTO TP111 procedures, collect the following readings for each day striping work has been conducted or when reading collected: • within a mile test section, collect 10 readings for each longitudinal line stripe, at no less than 40 feet intervals • where striping is less than 500 feet in length, collect reading at 50 foot intervals • readings collected shall be averaged. Excess beads to be removed prior to reading Bridge decks longitudinal lines, words and symbols shall be measured by presence and reflectivity on pavement surface Removal of non-applicable pavement markings or conflicting pavement markings	100% in accordance with the Manual on Uniform Traffic Control Devices (MUTCD) and the CDOT M&S Standard Plans. Retro-reflectivity reading in test section (mcd/m^2/lux): Longitudinal Lines – White 150 Longitudinal Lines – Yellow 100 Measured minimum presence: Longitudinal Lines 80% Words and Symbols 85% Visual inspection

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
4.2	Reflective markers	Reflective pavement markers (RPM's), are: • clean and clearly visible • of the correct color and type • reflective or retroreflective as required in the MUTCD and CDOT M&S Standards • correctly located, aligned and at the correct level • are firmly fixed • are installed in a way that will ensure that they remain at the correct level.	24 hrs	6 mo.	Number of pavement markers in any 10 consecutive markers that are ineffective. (Ineffective includes missing, nonreflective, broken, damaged, settled or sunk) Number of pavement marker casting securely fastened (Category 1 Defect) Uniformity; percentage (replacement RPM's having equivalent physical and performance characteristics to adjacent markers.)	Maintain or exceed condition as identified in the BACR.
4.3	Delineators & Markers	Object markers and delineators are: • clean and visible • of the correct color and type • legible and reflective • straight and vertical • placed per MUTCD and CDOT M&S Standards	2 hrs	28 days	Number of object markers or delineators defective or missing Sign sheeting material for object markers and delineator shall meet manufacturers minimum reflective requirements	Maintain or exceed condition as identified in the BACR. 100%

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
5.	**GUARD RAILS, BARRIERS, IMPACT ATTENUATORS**					
5.1	Guard rails and barrier walls	All guardrails, traffic barriers and other concrete barriers are maintained free of Defects. They are placed per MUTCD, CDOT's M&S Standards and CDOT's Roadway Design Manual and FHWA Roadside Design Guide.	2 hrs	1 mo.	Length free from Defects (loose nuts/bolts)	All nuts, bolts and connections to be properly tightened
					Surface condition	90% of surfaces to be free from Defects (spalling of concrete, failure of corrosion protection) within a 12.5 foot section. No Defect greater than 1 foot square or 1 cubic foot of missing material within a 12.5 foot section.
					Guardrail installed and maintained at correct height and distance from roadway and obstacle in accordance with relevant standards.	100% within 3 inches vertical of correct system height. Vegetation maintained and mowed at least 5 feet behind guardrail.
					Posts	No missing posts. No post shall have section loss greater than 25%, No two adjacent post shall have a combined section loss greater than 25%.
					Spacer Blocks	No missing spacer or rotated blocks. No section loss greater than 10%.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
5.2	Impact attenuators, anchor assembly, and end assembly	All impact attenuators, anchor assemblies, and end assemblies are appropriately placed and correctly installed per MUTCD, CDOT's M&S Standards and maintained free of damage.	2 hrs	1 mo.	Percentage of impact attenuators, anchor assemblies, and end assemblies correctly placed and installed and free of damage Integrity of the system	100% 100% cell replacement (unit replacement) following impact.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
6.	**SIGNS**					
6.1	General– all sign panels	Signs are clean, correctly located, clearly visible, legible, reflective, at the correct height and free from structural and electrical Defects. Identification markers are provided, correctly located, visible, clean and legible. Sign mounting posts are vertical, structurally sound and rust free. Visibility distances meet those stated in the MUTCD and CDOT M&S Standards. Sign information is of the correct size, location, type and wording to meet its intended purpose.	24 hrs	6 mo.	Compliance with regulations Retroreflectivity in accordance with the requirements of MUTCD Face Damage or Blockage Placement Sign information is of the correct size, location, type and wording to meet its intended purpose and requirements of MUTCD M&S Standards, Guide Signing Policies and Procedures Manual, CDOT Sign Design Manual, and Colorado Supplement Signs. Visual Inspection	No missing signs and 100% in accordance with the MUTCD Retroreflectivity is no less than that required by MUTCD. No signs with face damage greater than 10% of area or 0% if text is damaged or fading. No vegetation is impeding sign visibility. Signs are placed in accordance with Requirements of the MUTCD and CDOT M&S Standards 100% Post shall be plum.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
6.2	Safety critical signs	Requirements as 6.1, plus: "Stop," "Yield," "Do Not Enter," "One Way", and "Wrong Way" and all Turn-Prohibition signs are clean, legible and undamaged.	1 hr	7 days	Safety critical signs functionally legible when viewed from a vehicle travelling at posted speed Sign mounting posts and multi-Post breakaway installed and maintained per CDOT and/or CCD requirements.	No instances of signs functionally illegible (no twisting or leaning). All connections shall be free from Defects and free from debris or material that would impede function.
6.3	Obsolete, illegal or obscene signs, banners, flags, or posters	Removed from the Project	2 hr	N/A	Time for obsolete, illegal or obscene signs to be removed	100% compliance
7.	**TRAFFIC SIGNALS**					
7.1	Traffic Signals - General	Traffic Signals and their associated equipment are: • Be clean and visible, heads and buttons correctly aligned and operational • All traffic signal elements including cabinets, foundations, signing, vehicle detection (cameras or loops), electrical power	1 hr	6 mo.	Review of Maintenance records **a) General condition** Visual inspection **b) Damage** Visual inspection **c) Standards** Adhere to MUTCD and CCD	Maintained in accordance with Good Industry Practice Signals are clean and visible 100% of the time All signals are in compliance with MUTCD and CCD Standards. All signals are fully operational 100% of

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
		and boxes: are aligned correctly, structurally sound, full operational and free from damage caused by accident or vandalism			Standards	the time. Signals and signal elements are undamaged 100% of the time Electrical power 100% of the time Signal interconnect is fully functionally for permanent signals.
7.2	Traffic Signals Operations	Compliance with Accepted Temporary TCP	1 hr	1 mo.	Visual Inspection	100% of the time per Section 2.11 of Schedule 10.
7.3	Traffic Signals – Contingency	Contingency plans are in place to rectify Category 1 Defects not immediately repairable to assure alternative traffic control is provided during a period of failure.	NA	1 mo.	**Contingency Plan** Record Reviews	Full contingency plans are in place 100% of the time.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
8.	**LIGHTING**					
8.1	Existing Roadway Lighting – General	All lighting is free from Defects and provides acceptable uniform lighting quality. Lanterns are clean and correctly positioned.	24 hr	NA	Visual inspection and reporting log listing the following as a minimum: 1. Issue (e.g. inefficiencies, malfunction, cleanliness, etc.) 2. date and time of issue occurrence 3. date and time of report 4. reporting person 5. date and time of issue resolution	Written notification of outdoor lightning outage or repair requirement to Xcel Energy and Department, and reporting on a log 100% of time.
8.2	Existing Lighting Structures	Columns are upright correctly founded and structurally sound.	24 hrs	NA	Visual inspection and reporting log as per Ref. 8.1 in this Appendix A-1.	Written notification of outdoor lightning repair requirement to Xcel Energy and Department, and reporting on a log 100% of time. Structure is plumb.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
8.3	Existing Lighting Fixtures	All luminaries functioning on each pole	24 hrs	NA	Visual inspection and reporting log as per Ref. 8.1 in this Appendix A-1.	Written notification of outdoor lightning repair requirement to Xcel Energy and Department, and reporting on a log 100% of time.
8.4	Temporary Lighting- General, including pedestrian lighting	All lighting is free from Defects and provides acceptable uniform lighting quality. Lanterns are clean and correctly positioned.	24 hrs	14 days	Visual inspection and reporting log as per Ref. 8.1 in this Appendix A-1.	Level as per required in Section 2 of Schedule 10.
8.5	Temporary Lighting Structures, including pedestrian lighting	Columns are upright correctly founded and structurally sound	24 hrs	14 days	Visual inspection and reporting log as per Ref. 8.1 in this Appendix A-1. Structure is plumb.	Columns are plumb, bases are not damaged and np section loss. No hazard with wiring and loos assemblies to public.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
8.6	Temporary Lighting Fixtures, including pedestrian lighting	All luminaries functioning on each pole	24 hrs	14 days	Visual inspection and reporting log as per Ref. 8.1 in this Appendix A-1.	Lighting levels per Section 2 of Schedule 10. No instances of three consecutive lamps not working per circuit. No instances of two or more lamps not working per high mast pole.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
9.	**FENCES AND WALLS**					
9.1	Fences and Walls - Design and Location	Fences and walls act as designed and serve the purpose for which they were intended	1 hr	6 mo.	Visual Inspection	Maintain or exceed condition as identified in the BACR.
9.2	Fences and Walls - Construction (includes existing)	Integrity and structural condition of the fence is maintained	1 hr	6 mo.	Structural assessment if visual inspection warrants.	Maintain or exceed condition as identified in the BACR, and ensuring there are no structural safety issues.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
10.	**ROADSIDE**					
10.1	Vegetated Areas - Except landscaped areas – General (for areas that are not undergoing active construction)	Vegetation is maintained so that: i. Height of grass and weeds is kept within the limits described for urban and rural areas. Mowing begins before vegetation reaches the maximum height. ii. Spot mowing at intersections, ramps or other areas maintains visibility of appurtenances and sight distance. iii. Grass or vegetation does not encroach into or on paved shoulders, main lanes, sidewalks, islands, riprap, traffic barrier or curbs.	48 hrs	28 days	**Urban areas** Physical measurement of height of grass and weeds **Encroachment** Visual inspection of instances of encroachment of vegetation **Wildflowers** Visual Inspection with audit of process **Sight lines** Visual inspection **Noxious weeds** Visual inspection and/or notification	Individual measurement areas to have 80% of height of grass and weeds between 8” to 10”, and not shorter than 6” Occurrences of vegetation encroachment shall not exceed the condition identified in the BACR. Maintain or exceed the condition identified in the BACR. No instances of impairment of sight lines or sight distance to signs, including control of weeds in pavement and barrier. No blocked view of roadside reflectors Not more than 15% (aggregate) of a 1 mile section of roadway contains noxious weeds. Not more than 15% (aggregate) of a 1/10 mile section of ramp contains noxious weeds.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
10.1 (cont.)		iv. A herbicide program is undertaken to control noxious weeds in accordance with the EO D 006 99. v. Development and implementation of noxious weed management program to control noxious weeds and to eliminate grass in pavement or concrete. Avoid mowing zone 2 and 3 between April 15th and August 15, as required in Manual of Maintenance Procedures.				

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
10.2	Landscaped Areas (for areas that are not undergoing active construction)	i. All landscaped areas are maintained to their originally constructed condition. Landscaped areas are as designated in the plans. ii. Mowing, litter pickup, irrigation system maintenance and operation, plant maintenance, pruning, insect, disease and pest control, fertilization, mulching, bed maintenance, watering is undertaken as per MMP.	48 hrs	28 days	Visual inspection Roadside appearance is excellent, characterized by well-tended landscaping and vegetation.	The percent of landscaping area meeting the General Requirement is 85%.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
10.2 (cont.)	Landscaped Areas	iii. The height of grass and weeds is kept between 8" to 10", and not shorter than 6". Mowing begins before vegetation reaches a hazardous condition, such as sight distance, blocking reflectors, hiding animals or causing drifting snow. iv. Damaged or dead vegetation is replaced.				
10.3	Fire hazards	Fire hazards are controlled	24 hrs	N/A	Instances of dry brush or vegetation forming a fire hazard are removed.	No instances of plant material that is a fire hazard.
10.4	Trees, brush and ornamentals	i) Trees, brush and ornamentals on the right of way, except in established no mow areas, are trimmed in accordance with CDOT standards. ii) Trees, brush and ornamentals are trimmed to insure they do not interfere with vehicles or sight distance, or inhibit the	24 hrs	28 days	Visual inspection and/or notification	Maintain or exceed the condition identified in the BACR.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
		visibility of signs or shading on the road. iii) Dead trees, brush, ornamentals and branches are removed. Potentially dangerous trees or limbs are removed. iv) All undesirable and unplanned trees and vegetation are removed. Diseased trees or limbs are treated or removed by licensed personnel.				
10.5	Wetlands	Wetlands are properly managed, and in accordance with any applicable permit requirements.	48 hrs	N/A	In accordance with applicable permit requirements	Maintain or exceed the condition identified in the BACR.
10.6	Water Quality Ponds	Maintenance of all vegetation within the pond area	24 hrs	28 days	Visual inspection of ponds	Maintained as required per the design

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
11.	**EARTHWORKS & EMBANKMENTS**					
11.1	Slope – Stability	All structural or natural failures of the embankment, cut slopes, and slope and ditch paving on the Site are repaired.	1 hr	6 mo.	Visual inspection by geotechnical specialist and further tests as recommended by the specialist.	Maintain or exceed the condition identified in the BACR.
11.2	Slopes - General	Slopes are maintained in general conformance to the original graded cross-sections.	24 hrs	6 mo.	Areas where replacement of landscaping materials, reseeding and re-vegetation for erosion control purposes and removal and disposal of all eroded materials from the roadway and shoulders are required.	Maintain or exceed the condition identified in the BACR.
12.	**GRAFFITI**					
12.1	Graffiti	Graffiti removal on all Elements including but not limited to: • Signs, walls, barriers, guardrail, lighting, traffic signals, structural elements, fence, water quality and drainage features.	24 hrs	28 days	Removed in a manner and using materials that restore the surface to a like appearance similar to adjoining surfaces.	Inspection records showing 100% compliance

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
12.2	Offensive Graffiti	Offensive graffiti (i.e. graffiti that is insulting or causes offense to the public) is removed	6 hrs	N/A	Removed in a manner and using materials that restore the surface to a like appearance similar to adjoining surfaces. All offensive graffiti is considered a Category 1 Defect.	Inspection records showing 100% compliance for all accessible offensive graffiti without utilization of a lane closure for removal, and 90% compliance for all other offensive graffiti.
13.	**INCIDENT RESPONSE**					
13.1	General	Respond to Incidents in accordance with the Incident Response Plan.	1 hr	N/A	Incident Response Plan. No complaints from Emergency Services.	Response times met for 98% of Incidents measured on a 1 year rolling basis.
13.2	Spillage of Hazardous Materials	For any hazardous materials spills, comply with the requirements of Schedule 17.	1 hr	1 day	Incident Response Plan details the process and procedures in place and followed.	Inspection records showing compliance.
13.3	Elements damaged as a result of Incident - Structural Assessment	Evaluate damage to structures and liaise with emergency services to ensure safe working in clearing the Incident.	1 hr	1 day	Inspections and surveys of relevant Elements as required. (Note. CDOT staff bridge office shall be notified immediately to complete an inspection.)	Inspection records showing 100% compliance

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
13.4	Elements damaged as a result of Incident - Temporary and permanent remedy	Propose and implement temporary measures or permanent repairs to Defects arising from the Incident. Ensure the structural safety of any structures affected by the Incident.	24 hrs	6 mo.	Review and inspection of the relevant Elements.	Inspection records showing 100% compliance.
14.	**MAINTENANCE YARD** (The requirements set out in this Section 14 shall apply with effect from the Snow and Ice Control Commencement Date).					
14.1	Developer Identification Signs	Signs installed at the entrance(s)/exit(s) to/from the Maintenance Yard.	7 days	12 mo.	Signs installed depicting the name and contact information for Developer.	Signs functioning as designed.
14.2	Environmental contamination	No increase in contamination.	2 hr	6 mo.	Environmental site assessment or other inspections, as necessary.	No increase in contamination during the O&M Period During Construction.
14.3	Maintenance of grounds and buildings	Kept in a neat and tidy order. Kept structurally safe.	24 hr	6 mo.	Good housekeeping practice used to maintain buildings and land in a well maintained and neat condition, free from environmental damage. Regular inspection performed.	100% compliance

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
15.	**SNOW AND ICE REMOVAL**					
15.1	Response Time, material application vehicle	The manning and loading of material application vehicles for a Precipitation Event	½ hr	N/A	All spreading vehicles on any route ready to load anti-icing or de-icing materials within ½ hour as measured by winter operation records and AVL system monitoring.	The required maximum time to complete the manning and loading of all material application vehicles for an event is 0.5 hours from the time precipitation has started.
15.2	Response Time, plowing vehicle	The manning of a snowplow vehicle for a Precipitation Event	½ hr	N/A	All snowplow vehicles on any route have left the yard and ready to begin work within ½ hour as measured by winter operation records and AVL system monitoring.	The required maximum time to complete the manning of all snowplow vehicles for an event is 0.5 hours from the time precipitation has started to the time the unit has left its yard to begin work.
15.3	Plowing and material application	Continuous plowing and material application	½ hr	N/A	All units operating as measured by winter operation records and AVL monitoring systems.	Once operations have begun, all units as identified in the Snow and Ice Control Service Plan shall operate continuously on all routes so that bare and wet pavement is maintained.
15.4	Circuit time	Complete one entire route within 1 hour	1 hr	N/A	AVL systems monitoring and/or winter operation record.	Circuit time shall be 1 hour from the time a winter unit begins its plowing and/or material application route until the time it is complete.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
15.5	All lanes and ramps (including paved shoulders)	Bare and wet pavement during the Precipitation Event	1 hr 24 hr (paved shoulder)	N/A	Visual inspection and AVL system monitoring	Maintain Bare and Wet pavement during the Precipitation Event, or immediately at the End of Precipitation Event (meaning the time when snow or freezing rain stops falling and accumulating on any portion of a Route, when drifting ceases to cause accumulation on the Pavement or when frost is no longer creating a slippery condition) if all equipment listed in the most recently Accepted Snow and Ice Services Plan are continuously deployed.
15.6	Hazards	Address any snow and ice hazard immediately upon detection or notification	1 hr	N/A	Visual inspection, AVL system monitoring, or notification	100% compliance
15.7	Isolated slippery conditions	Address isolated slippery conditions.	1 hr	N/A	Visual inspection, AVL system monitoring, or notification	All isolated slippery conditions as identified by Developer, or notified by Emergency Services, the Department, and/or User are addressed.
15.8	Winter Snow and Ice Materials storage	Winter snow and Ice materials stored in tanks or covered buildings at all times.	½ hr	N/A	Visual inspection.	No instances of uncovered storage of winter de-icing/anti-icing materials or winter maintenance liquids.
15.9	Reporting requirements	All reporting requirements identified in Schedule 11 are accurate, complete, and timely 100% of the time.	1 day	N/A	Audit records and AVL system monitoring.	100% accuracy.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
15.10	Automated Vehicle Locator system	All identified vehicles equipped with on board AVL at all times, as required in Section 12 of this Schedule 11	24 hrs	1 mo.	Random audit, AVL system monitoring.	95% of all AVL units operational 100% of the time. No loss of data due to network service loss.
15.11	Material Spreader calibration	Spreader controller (including winter liquids) calibration is operational.	24 hrs	N/A	Random audit, AVL system monitoring	95% units operational 100% of the time
15.12	Winter Drainage	Melting snow and ice causing flooding.	1 hr	6 hrs	Visual inspection, AVL system monitoring	No flooding on roadway caused by snow and/or ice impeding drainage through or to drains, culverts and ditches at the End of Precipitation Event (as defined in REF 15.5 in Appendix A-1).
16. COURTESY PATROL						
16.1	Courtesy Patrol	Respond to any calls on the General Purpose Lanes or Tolled Express Lanes 15 min after being dispatched.	1/4 hr	N/A	Measured by patrol records, and AVL system.	Response times met for 95% of dispatches measured on a 1 year rolling basis.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
17. SWEEPING AND CLEANING						
17.1	Sweeping	i) Keep all channels, lanes, hard shoulders, gore areas, ramps, intersections, islands and frontage roads, and curb and gutter swept clean. ii) Clear and remove debris from all paved areas other than as required in Section 1.1 of this Appendix A-1. iii) Remove all sweepings without stockpiling in the right of way and dispose of at approved site.	1 hrs	28 days	Visual Inspection of buildup dirt, ice, rock, debris (from accidents and/or otherwise).	Inspection records showing 100% compliance.
17.2	Litter	i) Keep the Site in a neat condition, remove litter regularly ii) Pick up large litter items before mowing and sweeping operations. iii) Dispose of all litter and debris collected at an approved solid waste site. iv) Remove dead animals from the Site.	24 hrs	28 days	Visual Inspection of pieces of litter.	Inspection records showing 100% compliance

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
17.3	Sweeping	Clear and remove granular and sand material used as deicer or tractive material at the End of Precipitation Event (as defined in item 15.5).	1 hr	48 hrs	Visual Inspection.	Inspection records showing 100% compliance.
18. COVER (Note. The requirements in REF 18.1 to 18.18 of Section 18 (Cover) of Appendix A-2 (Performance and Measurement Criteria After Construction) shall apply to this Section 18 (Cover) of this Appendix A-1 (Performance and Measurement Criteria During Construction) at completion of Milestone 3.)						
18.1 to 18.18	See 'Element' in REF 18.1 to 18.18 in Appendix A-2	See 'General Requirement' in REF 18.1 to 18.18 in Appendix A-2	See 'Cat 1' in REF 18.1 to 18.18 in Appendix A-2	See 'Cat 2' in REF 18.1 to 18.18 in Appendix A-2	See 'Measurement Criteria' in REF 18.1 to 18.18 in Appendix A-2	See 'Target' in REF 18.1 to 18.18 in Appendix A-2

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
19. ITS AND ETC FACILITIES						
19.1	ITS Devices including but not limited to CCTV, microwave vehicle radar detection, road weather information systems, automatic traffic recorders, ramp meters, variable message signs and doppler radar units	Existing equipment shall be maintained to ensure equipment are fully functional and communicating, including but not limited: • Equipment are clean; • Defective equipment, fiber or devices are replaced or repaired	24 hr	1 mo.	Visual inspection and/or as identified by Department	90% of time
19.2	ITS and ETC Equipment (owned by Local Agency or by Department) installed by Developer and Backbone communication	Developer to provide reporting on inefficiencies or malfunction of ITS and ETC equipment, and backbone communication.	4 hrs	24 hrs	ITS and ETC reporting log or records.	100% reporting and follow up reporting on equipment corrections, repairs and connections to communication lines to ETC System Integrator, CTMC, and the Local Agency.

Appendix A-2 – Performance and Measurement Criteria After Construction

Unless stated otherwise, Measurement Criteria for pavement related Performance Requirements shall be measured using procedures, techniques and measuring equipment consistent with the Colorado DOT Distress Manual for HMA and PCC Pavements by National Center for Pavement Preservation, Appendix B of the Development of a Pavement Preventative Maintenance Program for the Colorado Department of Transportation, Report No. CDOT-DTD-R- 2004-17 Final Report.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
1.	**PAVEMENT (ROADWAY, RAMPS, ACCESS ROADS AND OTHER PAVED AREAS)**					
1.1	I-70 Mainline, CDOT Roadways, and Local Agency Roadways and connecting structures.	Free from obstructions and debris.	1 hrs	N/A	Visual Inspection	No obstructions or debris noted by visual inspection
1.2	Pavement - All roadways, including ramps, detours, and shoulders, (mainline including the bridge deck, covers, gratings, frames, expansion joints and boxes)	Smooth and quiet surface course with adequate skid resistance and free from Defects.	2 hrs	12 mo.	**a) Ruts** Percentage of wheel path length with ruts greater than 0.40 inches in depth. Depth of rut at any spot location. **b) Ride quality** Measured International Roughness Index (IRI) calculated according to ASTM E-1926 using equipment meeting AASHTO M-328 and operated in accordance with AASHTO R-57 using equipment verified and operators certified according to AASHTO R-56.	80% of project has ruts less than 0.40 inches. Not greater than 0.55 inches. Throughout 80% of maintained roadway area (other than shoulders less than 12-ft) less than or equal to 95 inches per mile on a contiguous 1/10th mile basis. Throughout 100% of maintained roadway area less than or equal to 160 inches per mile.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
1.2 (cont.)	Pavement - All roadways, including ramps, detours, and shoulders, (mainline including the bridge deck, covers, gratings, frames, expansion joints and boxes)	Smooth and quiet surface course with adequate skid resistance and free from Defects.	2 hrs	12 mo.	Localized roughness measured as mean IRI to ASTM E 1926 using a continuous 25 foot (7.6 m) base length analysis for each wheelpath. The area 25 feet each side of bridge decks may be deleted from the profile before IRI is determined. This excluded area, including the bridge decks, shall be evaluated for localized roughness. **c) Instances of Pavement Failures** Visual Inspection of roadway surface. Specific Defects are defined in Publication No. FHWA-RD-03-031, Long-Term Pavement Performance Program's Distress Identification Manual.	No instance of IRI greater than 300 inches per mile on a 25' continuous base length. No instances of failure including potholes, base failures, delamination of pavement layers, blowups, faulting (> 0.12"), punchouts. No instances of lane-to-lane or lane- to-shoulder separation or drop-off greater than 0.5 inches. Longitudinal cracking or joint separation less than 200 feet/tenth lane mile. Transverse cracking less than 15 each/tenth lane mile. No unsealed low and/or moderate cracking (as defined by FHWA RD- 03-031) and no high severity cracking (as defined by FHWA RD- 03-031). PCCP Specific: • Unsealed D-Cracking <2 slabs/tenth lane mile. • Corner Breaks<5 each/tenth mile

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
1.2 (cont.)	Pavement - All roadways, including ramps, detours, and shoulders (mainline including the bridge deck, covers, gratings, frames, expansion joints and boxes)					• Scaling<70 sq ft/tenth mile • Spalling<2 sq ft/tenth mile • No slabs broken in more than 3 pieces • No more than 2 broken slabs / tenth mile
					d) Edge drop-offs Physical measurement of edge drop- off level to adjacent surface,	Maintained roadway (including shoulder) free from instances greater than 2"
					e) Edge Break Physical measurement of pavement edge break.	No more than 50 cumulative feet of edge breaking greater than 4" wide.
1.2 (cont.)		Skid resistance shall be measured on 4 year cycle or after a resurfacing.	7 days	6 mo.	**Skid resistance** Skid resistance measured in accordance with ASTM E 274 Standard Test Method for Skid Resistance Testing of Paved Surfaces at 40 MPH using a full scale smooth tire meeting the requirements of ASTM E 524.	Average test value 25 or higher within any 0.5 mile section of mainline lanes, shoulders (other than shoulders less than 12-ft) and ramps.
		Posting of slippery road signs on sections exceeding skid resistance threshold.	2 hrs	6 mo.	Signs posted within timescale measured from test date.	100% of the time Average test value 25 or higher within any 0.5 mile section of mainline lanes, shoulders and ramps.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
		Perform site investigation and implement resultant required corrective action where skid resistance exceeds thresholds.	30 days	6 mo.	Delivery of site investigation report and implementation of resultant corrective actions within timescale measured from test date.	100% of the time Average test value 25 or higher within any 0.5 mile section of mainline lanes, shoulders and ramps.
		Removal of deleterious material and repair of damaged pavement	24 hrs	12 mo.	Oil, antifreeze, gasoline or other liquids spilled from vehicles onto traffic lanes is removed from the roadway	Incident logs and maintenance records demonstrate scheduled inspections and clean up times.
		Noise measurement is carried out when problem is suspected or complaints warrant investigation.	N/A	12 mo.	Pavement noise as measured by on board sound intensity and speed requirements in accordance with AASHTO TP 76 (measurements taken on a contiguous 1/10th mile basis)	Mainline and system ramps: < 105db
1.3	Crossovers, access roads and other paved areas	Crossovers, access roads and other paved areas are free of Defects.	4 hrs	12 mo.	Measurement of potholes and base failures	No instances of potholes or base failures
1.4	Curbs	Curbs are free from Defects.	24 hrs	12 mo.	Curb condition or length of alignment.	95% of continuous length of curb free from Defects and separation < ¼" from roadway surface. Curbs no more than 1" out of alignment over 10". No exposed rebar.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
1.5	Hard Capped Surface	Free of Defects and removal of deleterious material	24 hrs	6 mo.	Visual inspection	No instances of material tracking onto pavements or presence of weeds/grass.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
2.	**DRAINAGE SYSTEMS**					
2.1	Storm Sewer Systems (conduit, grates, catch basins, inlets, manholes, outfalls), including adjacent drainage conduit extending from an existing drainage structure to the next downstream existing drainage structure.	Each element of the drainage system is maintained to ensure it functions correctly from the point at which water drains to the outfall or drainage way,	1 hr	6 mo.	All storm sewers, pipes and conduits, regardless of size or location, inspected and rated in accordance with the CDOT Level of Service Manual (Drainage Inlets and Structures)	No instance of a condition rating for any inspected ratable item rated as Level of Service “B” or worse.
					Measurement of clogging and condition of pipes, conduits, catch basins, grates, inlets, or outfalls.	No instances of: • Clogging or blockage of pipes, conduits, grates, catch basins or inlets in pavement or adjacent to pavement, or outlet/outfalls greater than 10% of hydraulic capacity. • Clogging or blockage of catch basins or inlets in ditches greater than 25% of hydraulic capacity. • Damaged, insecure, rusted, or missing grates, end sections, metal structure or hardware
					Measurement of discontinuities and settlement between adjacent conduit segments or within conduit segment.	No offsets greater than 1.5 inches or ponding greater than 3 inches
					Measurement of cracking, spalling in concrete pipes, catch basins, inlets, culverts	No cracks open greater than 1/8”. No spalling, or scaling deeper than ¾”, or exposed reinforcement.
					Measurement of joints in drainage system.	No instances of separated joints or missing joint material or joints not soil tight.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
2.2	Open Water Carriers (standard roadside ditches, median ditches, relocated channels, channel linings)	Each Element of the drainage system is maintained to ensure it functions correctly.	24 hrs	12 mo.	Visual inspection and all elements rated in accordance with the CDOT Level of Service Manual (Drainage Ditches). Ditches/channel length out of alignment, and damages or missing sections in ditches/channel lining.	No instance of a condition rating for any inspected ratable item rated as “B” or worse. No instances of: Undermining, undercutting, erosion, or obstructions impeding the flow of water No ditches/channel length out of alignment, and no damaged or missing sections in ditches/channel lining.
2.3	Pavement Drainage (trench drains, slotted drains, gutters, catch basins, inlets, outlets)	Each element of the drainage system is maintained to ensure it functions correctly.	1 hrs	6 mo.	Measurement of standing water within I-70 Mainline, paved shoulder, or other paved surfaces.	No instances of standing water in any I-70 Mainline and paved surfaces, and no greater than 1” in depth elsewhere
2.4	Culverts	Culvert is maintained and functions correctly, joints remain soil tight and erosion controlled.	1 hrs	6 mo.	Culvert condition and functionality.	Culvert functioning as designed.
2.5	End Treatments (Headwalls, reinforced concrete outlets, concrete apron)	Elements are maintained to ensure they function correctly.	24 hours	6 mo.	Visual inspection of erosion, undercutting, scour, cracked, spalled, or broken concrete.	No instances of undercutting, scour, cracked, spalled, exposed rebar, or broken concrete.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
2.6	Storm Water systems	Storm Water Systems installed as permanent features maintained, functioning correctly, and operating as designed.	24 hrs	6 mo.	Compliance with regulations and standards and in accordance with CDOT's Erosion Control and Storm Water Quality Guide (ECSCG). **Manufactured Systems:** Compliance with manufacturers manuals **Vegetated Biofilters/Filter Strips:** Inspection of slopes and ditch bottom; vegetation management; debris and litter management. **Detention Ponds:** Inspected and checked for compliance with management plan. **Bioretention Cell, Infiltration:** Inspected for excessive ponding; overgrown vegetation, litter/debris; erosion and deposition; and outlet structure clogging **Infiltration Basin/Trenches:** Inspected for debris, overgrown vegetation, level of sedimentation; and condition of observation wells; **Constructed Wetlands:** Effectiveness of vegetation management; absence of	Operate as designed and no instances of non-compliance with regulations and standards and ECSQG. Operate as designed and routine clean-out, removed material sampled and tested in line with manufacturers manuals Filters performing as designed. All systems operate as designed and no instances of excessive ponding, threats to structural soundness of embankments and outlet structures; excessive erosion and sediment, seepage from embankments, overgrown vegetation, outlet clogging or litter/debris.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
					erosion, clogging; litter/debris and sediment.	
2.7	Discharge systems	Surface water discharge systems perform their proper function and discharge to groundwater and waterways complies with the relevant regulations and permits.	24 hrs	6 mo.	Compliance with regulations and in accordance with CDOT's Erosion Control and Storm Water Quality Guide.	No instances of non-compliance.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
3.	**STRUCTURES**					
3.1	Structures having an opening measured along the center of the roadway of more than 20 feet between under copings of abutments or springlines of arches or extreme ends of openings or multiple boxes. (Includes the Cover's structural components)	Substructures and superstructures are free of: • undesirable vegetation • debris and bird droppings • blocked drains, weep pipes manholes and chambers • blocked drainage holes in structural components • Defects in joint sealants • Defects in pedestrian protection measure • scour damage • corrosion of rebar • paint system failures • impact damage Bridge structures maintain a minimum vertical clearance of 16.5 feet over traveled lanes. Maintain structures to specified condition rating.	24 hrs	6 mo.	Inspection and assessment in accordance with the requirements of federal National Bridge Inspection Standards (NBIS) of the Code of Federal Regulations, 23 Highways – Part 650, the current version of the CDOT Pontis Bridge Inspection Coding Guide and AASHTO Manual for Bridge Evaluation of Bridges, the FHWA Bridge Inspector Reference Manual, AASHTO Manual for Bridge Element Inspection, and Recording and Coding Guide for the Structural Inventory and Appraisal of the Nation's Bridges.	Records as required in the current version of the CDOT Pontis Bridge Inspection Coding Guide and AASHTO Manual for Bridge Evaluation. No occurrence of NBI condition rating below seven for any new and widened deck, superstructure or substructure. No occurrence of NBI condition rating below six for any existing or rehabilitated deck, superstructure or substructure, prior to reconstruction of a new structure. All Pontis condition states to be one or two for all structure components.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
3.2	Structure component (Includes the Cover's structural components)	i) Expansion joints are free of: • dirt debris and vegetation • Defects in drainage systems • loose nuts and bolts • Defects in gaskets • leaking ii) The deck drainage system is free of all and operates as intended. iii) Barriers are free of: • loose nuts or bolts • blockages of hollow section drain holes • vegetation • accident damage iv) Bearings and bearing shelves are clean. v) Maintain settlement within specified requirement.	24 hrs	6 mo.	Inspection and assessment in accordance with the requirements of federal National Bridge Inspection Standards (NBIS) of the Code of Federal Regulations, 23 Highways – Part 650, the current version of the CDOT Pontis Bridge Inspection Coding Guide and AASHTO Manual for Condition Evaluation of Bridges, the FHWA Bridge Inspector Reference Manual, AASHTO Manual for Bridge Element Inspection, and Recording and Coding Guide for the Structural Inventory and Appraisal of the Nation's Bridges.	Records as required in the current version of the CDOT Pontis Bridge Inspection Coding Guide and AASHTO Manual for Bridge Evaluation. No occurrences of NBI condition rating below seven for any new and widened deck, superstructure or substructure No occurrence of NBI condition rating below six for any existing or rehabilitated deck, superstructure or substructure, prior to reconstruction of a new structure. All Pontis condition states to be one or two for all structure components. Differential settlement of bridge approach slabs: Less than 1-inch total settlement and less than 0.5 inch differential between end of approach slabs.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
3.2 (cont.)	Structure component (continued)	vi) Sliding and roller surfaces are clean and greased to ensure satisfactory performance. Additional advice contained in bearing manufacturers' instructions, in the Current CDOT M&S Standard Plans, Standard Specification for Road and Bridge Construction is followed. Special finishes are clean and perform to the appropriate standards. vii) All non-structural items such as hoists and electrical fixings, operate correctly, are clean and lubricated as appropriate, in accordance with the manufacturer's recommendations and certification of lifting devices are maintained. viii) Maintain structures to specified condition rating.				100% compliance for Elements without Pontis or NBI condition rating targets.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
3.3	Structures – General (Includes the Cover's structural components)	Safe operation of structures, maintained to prevent safety issues arising	1 hr	12 mo.	Inspection of concrete surfaces adjacent to and above the Roadway	No instances of delaminated concrete above the Roadway.
3.4	Structures – Bridge girders/beams (Includes the Cover's structural components)	Design stress is not exceeded in bridge girders/ beams (particularly in skew bridge decks)	1 hr	12 mo.	Measurement of out of plumb twisting/rotation of bridge girders/beams.	The out-of-plumb rotation of bridge girders/beams shall not exceed 0.6° or 1/8 in. per ft
3.5	Non-bridge class culverts	Non-bridge-class culverts are free of: • vegetation and debris and silt • Defects in sealant to movement joints • scour damage	24 hrs	6 mo.	Inspection and assessment in accordance with the requirements of federal National Bridge Inspection Standards (NBIS) of the Code of Federal Regulations, 23 Highways – Part 650, the current version of the CDOT Pontis Bridge Inspection Coding Guide and AASHTO Manual for Bridge Evaluation, the FHWA Bridge Inspector Reference Manual, AASHTO Manual for Bridge Element Inspection, and Recording and Coding Guide for the Structural Inventory and Appraisal of the Nation's Bridges.	Records as required in the current version of the CDOT Pontis Bridge Inspection Coding Guide and AASHTO Manual for Bridge Evaluation. No occurrences of NBI condition rating below seven for any culvert elements. All Pontis condition states to be one or two for all structure components. None with vegetation, debris and silt. None with Defects in sealant and movement joints. None with scour damage.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
3.6	Retaining Walls (other than MSE walls)	Maintain retaining walls to be structurally sound, and free of vertical, lateral or rotational movement with no material Defects compromising the intended performance.	48 hrs	12 mo.	Condition of exposed surfaces showing cracking, spalling, leaking, build-up of efflorescence and rust staining.	No more than 5% of a combined retaining wall area of each wall showing cracking with leaking, build-up of efflorescence, delamination's, spalls, and rust staining. No concrete surfaces with spalls greater than 1" deep or to reinforcement level.
					Area of cracks measured as the length of the crack and six inches on either side of the centerline of the crack.	No more than 5% of retaining wall area showing cracking of >1/8".
					Measurement of settlement of spread footing foundations in deviation from constructed elevation.	None greater than 1.5" total or 1/2" in a 5 year period
					Measurement of rotational movement resulting in deviation from constructed alignment using a 10 foot straight edge.	None greater than ½" horizontal movement within 10' vertical.
					Visual Inspection	Free from vegetation and overgrowth of trees. At least 90% of drain holes are free of build up (for any walls).

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
3.7	MSE Retaining Walls	Maintain retaining walls to be structurally sound, and free of vertical, lateral or rotational movement with no material Defects compromising the intended performance.	48 hrs	12 mo.	Panel condition	No more than 5% showing cracking, delamination's, spalls, or scaling per panel or each MSE wall. No instances cracks >1/4", on more than one panel per wall. No concrete surfaces with spalls greater than 1" deep or to reinforcement level.
					Joint condition	No instances of joints with exposed fabric, MSE backfill material below joint or vegetation growing between joints Panel offset at joints shall not exceed 3/4 inch. Joint opening shall not exceed ¼ inch greater or ½ inch less than the design width along adjoining panels.
					Measured erosion	No instances of erosion >1 feet deep along wall coping, erosion exposing the top of the leveling pad (where pad is not on rock), or exposed straps or mesh
					Measurement of bowed wall: variance from constructed alignment. Change from as built records measured using 10' straight edge.	No instances of variance from constructed alignment greater than 3/4 inch horizontal movement within 10' vertical
					Visual Inspection	Free from vegetation and overgrowth of trees.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
3.8	Sign structures	Sign gantries and foundations are structurally sound and free of: loose nuts and bolts, Defects in surface protection systems	24 hrs	6 mo.	Inspection and assessment in accordance with the requirements of CDOT Recording and Coding Guide for the Inventory and Inspection of Colorado's Overhead Signs, Signals and High Mast Lights and CDOT M&S Standard Plans.	All condition states to be one or two for all structural members. None with loose assemblies. None with Defects in surface protection.
3.9	Load ratings (Includes the Cover's structural components)	All structures shall have adequate capacity for the design load, legal loads (including Specialized Hauling Vehicles and Notional Rating Load, as referenced in AASHTO Manual for Bridge Evaluation, and Colorado Permit Vehicle, as referenced in CDOT Bridge Rating Manual)	24 hrs	6 mo.	Load rating calculations in accordance with the AASHTO Manual for Bridge Evaluation, the current version of the CDOT Pontis Bridge Inspection Coding, and CDOT Bridge Rating Manual. Load restriction requirements as per AASHTO Manual for Bridge Evaluation, the current version of the CDOT Pontis Bridge Inspection Coding, and CDOT Bridge Rating Manual.	Comply with load restrictions on new structures for Colorado legal loads (including legally permitted vehicles).
4.	**ROADWAY MARKING**					
4.1	Pavement markings – General (includes temporary marking in the event of future	Pavement markings are: • clean and visible during the day and at night • whole and complete and of the correct color, type, width and length • correctly placed to meet the MUTCD	24 hrs	1 mo.	Compliance with regulations Using a calibrated retro-reflectometer, in conformance with	100% in accordance with the Manual of Uniform Traffic Control Devices (MUTCD) and the MUTCD -Colorado Supplement Retro-reflectivity reading in test section (mcd/m^2/lux): Longitudinal Lines – White 150 Longitudinal Lines – Yellow 100

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
	Construction work done by Developer, and permanent marking) (excludes crosswalk and stop bar pavement markings at signalized ramp intersections, which such markings are maintained by Local Agency)	and the Colorado Supplement to MUTCD and CDOT M&S Standard Plans. Non applicable pavement markings are removed.			ASTM E 1710 or AASHTO TP111 procedures, collect the following readings for each day striping work has been conducted or when reading collected: • within a mile test section, collect 10 readings for each longitudinal line stripe, at no less than 40 feet intervals. • where striping is less than 500 feet in length, collect reading at 50 foot intervals • readings collected shall be averaged. Excess beads to be removed prior to reading Bridge decks longitudinal lines, words and symbols shall be measured by presence and reflectivity on pavement surface Removal of non-applicable pavement markings or conflicting pavement markings	Measured minimum presence: Longitudinal Lines 80% Words and Symbols 85% Visual inspection

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
4.2	Reflective markers	Reflective pavement markers (RPM's), are: • clean and clearly visible • of the correct color and type • reflective or retroreflective as required in the MUTCD and CDOT M&S Standards • correctly located, aligned and at the correct level • are firmly fixed • are installed in a way that will ensure that they remain at the correct level.	24 hrs	6 mo.	Number of pavement markers that are ineffective. (Ineffective includes missing, nonreflective, broken, damaged, settled or sunk) Number of pavement marker casting securely fastened (Category 1 Defect) Uniformity; percentage (replacement RPM's having equivalent physical and performance characteristics to adjacent markers.)	Less than 10-percent ineffective in a centerline mile, with no more than two (2) consecutive RPMs missing or non-reflective. 100% 100%
4.3	Delineators & Markers	Object markers and delineators are: • clean and visible • of the correct color and type • legible and reflective • straight and vertical • placement per MUTCD, and CDOT M&S Standards	1 hr	28 days	Number of object markers or delineators defective or missing. Sign sheeting material for object markers and delineator shall meet manufacturers minimum reflective requirements.	No more than 10% of delineators or markings will be missing or not easily visible in any 1 mile section. 100%

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
5.	**GUARD RAILS, BARRIERS, IMPACT ATTENUATORS**					
5.1	Guard rails and barrier walls	All guardrails, traffic barriers and other concrete barriers are maintained free of Defects. They are placed per MUTCD, CDOT's M&S Standards and Roadway Design Manual and FHWA Roadside Design Guide.	1 hr	1 mo.	Length free from Defects (loose nuts/bolts)	All nuts, bolts and connections to be properly tightened
					Surface condition	90% of surfaces to be free from Defects (spalling of concrete, failure of corrosion protection) within a 12.5 foot section. No Defect greater than 1 foot square or 1 cubic foot of missing material within a12.5 foot section. No exposed rebar.
					Guardrail installed and maintained at correct height and distance from roadway and obstacle	100% within 3 inches vertical of correct system height.
					Alignment	No misalignment of more than 4 inches.
					Vegetation	Vegetation maintained and mowed and chemically controlled in front and under and at least 5 feet behind guardrail.
					Posts	No missing posts. No post shall have section loss greater than 25%, No two adjacent post shall have a combined section loss greater than 25%.
					Spacer Blocks	No missing spacer or rotated blocks. No section loss greater than 10%.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
5.2	Impact attenuators, anchor assembly, and end assembly	All impact attenuators, anchor assemblies, and end assemblies are appropriately placed and correctly installed per MUTCD, CDOT's M&S Standards, and maintained free of damage.	1 hr	1 mo.	Percentage of impact attenuators, anchor assemblies, and end assemblies correctly placed and installed and free of damage Integrity of the system	100% 100% cell replacement (unit replacement) following impact.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
6.	**SIGNS**					
6.1	General – all sign panels	Signs are clean, correctly located, clearly visible, legible, reflective, at the correct height and free from structural and electrical Defects	24 hrs	6 mo.	Compliance with regulations	No missing signs and 100% in accordance with the current edition of the (MUTCD)
					Retroreflectivity measured in accordance with the requirements of MUTCD	Retroreflectivity is no less than that required by MUTCD and the Colorado Supplement for retroreflectivity.
		Identification markers are provided, correctly located, visible, clean and legible				
					Face Damage or Blockage	No signs with face damage greater than 5% of area or 0% if text is damaged or fading. No vegetation is impeding sign visibility.
		Sign mounting posts are vertical, structurally sound and rust free				
		Visibility distances meet those stated in the MUTCD and CDOT M&S Standards			Placement	Signs are placed in accordance with Requirements of the MUTCD and the Colorado Supplement
		Sign information is of the correct size, location, type and wording to meet its intended purpose			Sign information is of the correct size, location, type and wording to meet its intended purpose and requirements of MUTCD, M&S Standards, Guide Signing Policies and Procedures Manual, CDOT Sign Design Manual, and Colorado Supplement Signs	100%
					Visual Inspection	Post shall be plum

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
6.2	Safety critical signs	Requirements as 6.1, Plus: "Stop," "Yield," "Do Not Enter," "One Way" and "Wrong Way" and all Turn-Prohibition signs are clean, legible and undamaged.	1 hr	7 days	Safety critical signs functionally legible when viewed from a vehicle travelling at posted speed Sign mounting posts and multi-Post breakaway installed and maintained per CDOT requirements.	No instances of signs functionally illegible, no twisting or leaning. All connections shall be free from Defects and free from debris or material that would impede function.
6.3	Obsolete, illegal or obscene signs, banners, flags, or posters	Removed from the Project	2 hrs	N/A	Time for obsolete, illegal or obscene signs, banners, flags, or posters to be removed	100% compliance
7.	**TRAFFIC SIGNALS**					
7.1	Traffic Signals - General	Traffic Signals shall meet the following: • Be clean and visible, heads and buttons correctly aligned and operational • All traffic signal elements including cabinets, foundations, signing, vehicle detection (cameras or loops), electrical power and boxes: are aligned correctly, structurally sound, full operational	24 hrs	NA	Traffic signal issue reporting log listing the following as a minimum: 1. Issue (e.g. inefficiencies, malfunction, cleanliness, etc.) 2. date and time of issue occurrence 3. date and time of report 4. reporting person 5. date and time of issue resolution	Written notification of issue to CCD and Department, and reporting on a log 100% of time.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
		and free from damage caused by accident or vandalism				
8.	**LIGHTING**					
8.1	Roadway Lighting – General	All lighting is free from Defects and provides acceptable uniform lighting quality. Lanterns are clean and correctly positioned.	24 hrs	NA	Visual inspection and reporting log listing the following as a minimum: 1. Issue (e.g. inefficiencies, malfunction, cleanliness, etc.) 2. date and time of issue occurrence 3. date and time of report 4. reporting person 5. date and time of issue resolution	Written notification of outdoor lightning outage or repair requirement to Xcel Energy and Department, and reporting on a log 100% of time.
8.2	Lighting Structures	Columns are upright correctly founded and structurally sound.	24 hrs	NA	Visual inspection and reporting log as per Ref. 8.1 in this Appendix A-2. Structure is plumb.	Written notification of outdoor lightning repair requirement to Xcel Energy and Department, and reporting on a log 100% of time.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
8.3	Lighting Fixtures	All luminaries functioning on each pole.	24 hrs	NA	Visual inspection and reporting log as per Ref. 8.1 in this Appendix A-2.	Written notification of outdoor lightning outage or repair requirement to Xcel Energy and Department, and reporting on a log 100% of time.
9.	**FENCES AND WALLS**					
9.1	Fences and Walls - Design and Location	Fences and walls act as designed and serve the purpose for which they were intended	1 hr	6 mo.	Visual Inspection based on design of fences and walls	Inspection records showing compliance with design No unintended opening in fences or walls.
9.2	Fences and Walls - Construction (includes existing)	Integrity and structural condition of the fence is maintained	< 1 hr	6 mo.	Structural assessment if visual inspection warrants	Inspection records showing compliance with design, and no structural safety issues.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
10.	**ROADSIDE**					
10.1	Vegetated Areas - Except landscaped areas - General	Vegetation is maintained so that: i. Height of grass and weeds is kept within the limits described for urban and rural areas. Mowing begins before vegetation reaches the maximum height. ii. Spot mowing at intersections, ramps or other areas maintains visibility of appurtenances and sight distance. iii. Grass or vegetation does not encroach into or on paved shoulders, main lanes, sidewalks, fences and walls, slope pavement, islands, riprap, traffic barrier or curbs.	24 hrs	28 days	**Urban areas** Physical measurement of height of grass and weeds **Encroachment** Visual inspection of instances of encroachment of vegetation **Wildflowers** Visual Inspection with audit of process. **Sight lines** Visual inspection	Individual measurement areas to have 95% of height of grass and weeds between 8” to 10”, and not shorter than 6”. No occurrences of vegetation encroachment. Adherence to CDOT Roadside Vegetation Management (Final Guideline Document). No instances of impairment of sight lines or sight distance to signs, including control of weeds in pavement and barrier. No blocked view of roadside reflectors.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
10.1 (cont.)		iv. A herbicide program is undertaken to control noxious weeds in accordance with the EO D 006 99. v. Development and implementation of noxious weed management program to control noxious weeds and to eliminate grass in pavement or concrete. Avoid mowing zone 2 and 3 between April 15th and August 15, as required in Manual of Maintenance Procedures.			**Noxious weeds** Visual inspection and/or notification	Not more than 15% (aggregate) of a 1 mile section of roadway contains noxious weeds. Not more than 15% (aggregate) of a 1/10 mile section of ramp contains noxious weeds.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
10.2	Landscaped Areas (refer to General Requirement i. to iv. for any landscaped areas other than top of Cover; and v. for landscaped areas on top of Cover) (applicable after the issuance of the Notice of Substantial Landscape Completion pursuant to Section 14.9 of Schedule 10 (*Design and Construction Requirements*)	i. All landscaped areas are maintained to their originally constructed condition and in accordance with Section 14 of Schedule 10 (*Design and Construction Requirements*). Landscaped areas are as designated in the plans. ii. Mowing, litter pickup, irrigation system maintenance and operation, plant maintenance, pruning, insect, disease and pest control, fertilization, mulching, bed maintenance, watering is undertaken as per MMP.	24 hrs	28 days	Visual inspection Appearance is excellent, characterized by well-tended landscaping and vegetation.	The percent of landscaping area meeting the General Requirement is more than 90%.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
10.2 (cont.)	Landscaped Areas	iii. The height of grass and weeds is kept between 8" to 10", and not shorter than 6". Mowing begins before vegetation reaches a hazardous condition, such as sight distance, blocking reflectors, hiding animals or causing drifting snow. iv. Damaged or dead vegetation is replaced. v. Landscaping on top of the Cover is to be carried out by Developer until the end of the Landscape Warranty period, (as described in Section 14.11 of Schedule 10 (*Design and Construction Requirements*)) in accordance with Section 14 of Schedule 10 (*Design and Construction Requirements*)				
10.3	Fire hazards	Fire hazards are controlled	12 hrs	14 days	Instances of dry brush or vegetation forming a fire hazard	No instances of plant material that is a fire hazard

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
10.4	Trees, brush and ornamentals (Other than landscaped areas, where REF 10.2 would apply)	i) Trees, brush and ornamentals on the right of way, except in established no mow areas, are trimmed in accordance with CDOT standards. ii) Trees, brush and ornamentals are trimmed to insure they do not interfere with vehicles or sight distance, or inhibit the visibility of signs or shading on the road. iii) Dead trees, brush, ornamentals and branches are removed. Potentially dangerous trees or limbs are removed. iv) v) All undesirable and unplanned trees and vegetation are removed. Diseased trees or limbs are treated or removed by licensed persons.	24 hrs	28 days	Visual inspection and/or notification	Inspection records showing 100% compliance

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
10.4 (cont.)		iv) All undesirable and unplanned trees and vegetation are removed. Diseased trees or limbs are treated or removed by licensed personnel.				
10.5	Wetlands	Wetlands are properly managed, and in accordance with applicable permit requirements.	24 hrs	28 days	In accordance with applicable permit requirements	No Instances of permit requirements not met.
10.6	Water Quality Ponds	Maintenance of all vegetation within the pond area.	24 hrs	28 days	Visual inspection of ponds	Maintained as required per the design
11.	**EARTHWORKS & EMBANKMENTS**					
11.1	Slope - Stability	All structural or natural failures of the embankment, cut slopes, and slope and ditch pavement Defects on the Site are repaired.	1 hr	6 mo.	Visual inspection by geotechnical specialist and further tests as recommended by the specialist	No instances of slope failure, and no unsealed cracks or joints on paved slopes. No vegetation on paved slopes. No rut, washout, or deviation greater than 6 inches and more than 2 foot wide.
11.2	Slopes - General	Slopes are maintained in general conformance to the original graded cross-sections	24 hrs	6 mo.	Areas where replacement fill and of landscaping materials, reseeding and re-vegetation for erosion control purposes and removal and proper disposal of all eroded materials from the roadway	No slope failures. Inspection records showing compliance.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
					and shoulders are required.	
12.	**GRAFFITI**					
12.1	Graffiti	Graffiti removal on all Elements including but not limited to: • Signs, walls, barriers, guardrail, lighting, traffic signals, structural elements, fence, water quality and drainage features.	24 hrs	28 days	Removed in a manner and using materials that restore the surface to a like appearance similar to adjoining surfaces.	Inspection records showing 100% compliance
12.2	Offensive Graffiti	Offensive graffiti (i.e. graffiti that is insulting or causes offense to the public) is removed	6 hr	N/A	Removed in a manner and using materials that restore the surface to a like appearance similar to adjoining surfaces. All offensive graffiti is considered a Category 1 Defect.	Inspection records showing 100% compliance for all accessible offensive graffiti without utilization of a lane closure for removal , and 90% compliance for all other offensive graffiti.
13.	**INCIDENT RESPONSE**					
13.1	General	Respond to Incidents in accordance with the Incident Response Plan.	1 hr	N/A	Incident Response Plan. No complaints from Emergency Services.	Response times met for 98% of Incidents measured on a 1 year rolling basis.
13.2	Spillage of Hazardous Materials	For any hazardous materials spills, comply with the requirements of Schedule 17.	1 hr	1 day	Incident Response Plan details the process and procedures in place and followed.	Inspection records showing compliance
13.3	Elements damaged as a result of Incident - Structural Assessment	Evaluate damage to structures and liaise with emergency services to ensure safe working in clearing the Incident.	2 hr	1 day	Inspections and surveys of relevant Elements as required. (Note. CDOT staff bridge office shall be notified immediately to complete an inspection.)	Inspection records showing 100% compliance

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
13.4	Elements damaged as a result of Incident - Temporary and permanent remedy	Propose and implement temporary measures or permanent repairs to Defects arising from the Incident. Ensure the structural safety of any structures affected by the Incident.	24 hrs	6 mo.	Review and inspection of the relevant Elements.	Inspection records showing 100% compliance.
14.	**MAINTENANCE YARD**					
14.1	Developer Identification Signs	Signs installed at the entrance(s)/exit(s) to/from the Maintenance Yard	7 days	12 mo.	Signs installed depicting the name and contact information for Developer	Signs functioning as designed.
14.2	Environmental contamination	No increase in contamination.	2 hrs	6 mo.	Environmental site assessment or other inspections, as necessary.	No increase in contamination during the Operating Period.
14.3	Maintenance of grounds and buildings	Kept in a neat and tidy order. Kept structurally safe.	24 hr	6 mo.	Good housekeeping practice used to maintain buildings and land in a well maintained and neat condition, free from environmental damage. Regular inspection performed.	100% compliance
15.	**SNOW AND ICE REMOVAL**					
15.1	Response Time, material application vehicle	The manning and loading of material application vehicles for a Precipitation Event	½ hr	N/A	All spreading vehicles on any route ready to load anti-icing or de-icing materials within ½ hour as measured by winter operation records and AVL system monitoring.	The required maximum time to complete the manning and loading of all material application vehicles for an event is 0.5 hours from the time precipitation has started.
15.2	Response Time, plowing vehicle	The manning of a snowplow vehicle for a	½ hr	N/A	All snowplow vehicles on any route have left the yard and ready to	The required maximum time to complete the manning of all snowplow vehicles for

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
		Precipitation Event			begin work within ½ hour as measured by winter operation records and AVL system monitoring.	an event is 0.5 hours from the time precipitation has started to the time the unit has left its yard to begin work.
15.3	Plowing and material application	Continuous plowing and material application	½ hr	N/A	All units operating as measured by winter operation records and AVL monitoring systems.	Once operations have begun, all units as identified in the Snow and Ice Control Service Plan shall operate continuously on all routes so that bare and wet pavement is maintained.
15.4	Circuit time	Complete one entire route within 1 hour	1 hr	N/A	AVL systems monitoring and/or winter operation record	Circuit time shall be 1 hour from the time a winter unit begins its plowing and/or material application route until the time it is complete.
15.5	All lanes and ramps (including paved shoulders)	Bare and wet pavement during the Precipitation Event	1 hr 24 hrs (paved shoulder)	N/A	Visual inspection and AVL system monitoring	Maintain Bare and Wet pavement during the Precipitation Event, or immediately at the End of Precipitation Event (as defined in REF 15.5 in Appendix A-1) if all equipment listed in the most recently Accepted Snow and Ice Services Plan are continuously deployed.
15.6	Hazards	Address any snow and ice hazard immediately upon detection or notification	1 hr	N/A	Visual inspection, AVL system monitoring, or notification	100% compliance
15.7	Isolated slippery conditions	Address isolated slippery conditions.	1 hr	N/A	Visual inspection, AVL system monitoring, or notification	All isolated slippery conditions as identified by Developer, or notified by Emergency Services, the Department, and/or User are addressed.
15.8	Winter Snow and Ice Materials storage	Winter snow and Ice materials stored in tanks or covered	½ hr	N/A	Visual inspection.	No instances of uncovered storage of winter de-icing/anti-icing materials or winter maintenance liquids.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
		buildings at all times.				
15.9	Reporting requirements	All reporting requirements identified in Schedule 11 are accurate, complete, and timely 100% of the time.	1 day	N/A	Audit records and AVL system monitoring.	100% accuracy.
15.10	Automated Vehicle Locator system	All identified vehicles equipped with on board AVL at all times, as required in Section 12 of this Schedule 11	24 hrs	1 mo.	Random audit, AVL system monitoring.	95% of all AVL units operational 100% of the time. No loss of data due to network service loss.
15.11	Material Spreader calibration	Spreader controller (including winter liquids) calibration is operational.	24 hrs	N/A	Random audit, AVL system monitoring	95% units operational 100% of the time
15.12	Winter Drainage	Melting snow and ice causing flooding.	1 hr	6 hrs	Visual inspection, AVL system monitoring	No flooding on roadway caused by snow and/or ice impeding drainage through or to drains, culverts and ditches at the End of Precipitation Event (as defined in REF 15.5 in Appendix A-1).
16. COURTESY PATROL						
16.1	Courtesy Patrol	Respond to any calls on the General Purpose Lanes or Tolled Express Lanes 15 min after being dispatched.	1/4 hr	N/A	Measured by patrol records, and AVL system.	Response times met for 95% of dispatches measured on a 1 year rolling basis.
17. SWEEPING AND CLEANING						
17.1	Sweeping	i) Keep all channels, lanes, hard shoulders, gore areas, ramps,	1 hr	28 days	Visual Inspection of buildup dirt, ice, rock, debris (from accidents and/or otherwise).	Inspection records showing 100% compliance

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
		intersections, islands and frontage roads, and curb and gutter swept clean. ii) Clear and remove debris from all paved areas other than as required in Section 1.1 of this Appendix A-2. iii) Remove all sweepings without stockpiling in the right of way and dispose of at approved site.				
17.2	Litter	i) Keep the Site in a neat condition, remove litter regularly ii) Pick up large litter items before mowing and sweeping operations. iii) Dispose of all litter and debris collected at an approved solid waste site. iv) Remove dead animals from the Site.	24 hrs	28 days	Visual Inspection of pieces of litter.	Inspection records showing 100% compliance

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
17.3	Sweeping	Clear and remove granular and sand material used as deicer or tractive material at the End of Precipitation Event (as defined in item 15.5).	1 hr	48 hrs	Visual Inspection.	Inspection records showing 100% compliance.
18.	**COVER (Note. The TOMIE Manual referred to in the Measurement Criteria is the Accepted Tunnel Operation, Maintenance, Inspection and Evaluation Manual (TOMIE) as described in Section 12 (*Cover MEP System*) of Schedule 10 (*Design and Construction Requirements*).)**					
18.1	Snow and ice removal	Snow and ice removal in the Cover section and at access and egress points	1 hr	3 hr	Visual observation and/or AVL system monitoring.	No snow or ice along the Cover structure wall and soffit. No snow or ice along the right shoulder at the access and egress points.
18.2	Subsurface structures	All subsurface structures, including passive fire protection, shall be free of Defects.	1 hr	N/A	All subsurface structures maintained and inspected in accordance with National Tunnel Inspection Standards, Highway and Rail Transit Tunnel Maintenance and Rehabilitation Manual, and the Tunnel, Operations, Maintenance, Inspection, Evaluation (TOMIE) Manual and the Specifications for the National Tunnel Inventory (SNTI).	Elements maintained free of Defects

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
18.3	Structural supports and Connections for all miscellaneous structural attachments or supports	Structural Supports & Connections for all miscellaneous structural attachments or supports shall be free of Defects.	1 hr	6 mo.	All structural supports maintained and inspected in accordance with National Tunnel Inspection Standards, Highway and Rail Transit Tunnel Maintenance and Rehabilitation Manual, and the Tunnel, Operations, Maintenance, Inspection, Evaluation (TOMIE) Manual and the Specifications for the National Tunnel Inventory (SNTI).	All Elements with full capacity connections in accordance with the design and manufacturer's requirements Sections free of loss of connection material due to impact, corrosion, or wear. Free of loose connections or bolts. Free of deterioration or damage of base structure material. Free of movement of supported item. Free of excessive vibration of supported item.
18.4	Retaining Walls	As a minimum free of the Defects as identified in Section 3 Structures of this Appendix A-2.	1 hr	6 mo.	Compliance with Maintenance Management Plan (MMP). The plan shall be based on the Tunnel, Operations, Maintenance, Inspection, Evaluation (TOMIE) Manual, Highway and Rail Transit Tunnel Maintenance and Rehabilitation Manual, and in accordance with Section 3 Structures of this Appendix A-2.	All Elements maintained free of Defects.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
18.5	Monolithic waterproofing membrane, reinforcing, flashing, protection course / root barrier protection – at landscape areas, protection course – at vehicular and pedestrian traffic areas	Subsurface structures shall be free of leaks. Elements shall be free of Defects and function as designed.	24 hrs	6 mo.	Visual Inspection and in accordance with the Tunnel, Operations, Maintenance, Inspection, Evaluation (TOMIE) Manual. Section 519 (*Garden Roof Assembly*) of Section 14 (*Landscaping and Aesthetics*) of Appendix A (*Project Special Provisions*) of Schedule 10 (*Design and Construction Requirements*)	The subsurface structures shall be free of leaks. Elements shall be free of Defects and function as designed.
18.6	Finishes	All finishes shall be free of Defects and clean.	24 hrs	6 mo.	Visual inspection and in accordance with the Tunnel, Operations, Maintenance, Inspection, Evaluation (TOMIE) Manual, Highway and Rail Transit Tunnel Maintenance and Rehabilitation Manual, and the Specifications for the National Tunnel Inventory (SNTI).	Maintaining level of reflectivity and brightness consistent with lighting level criteria, free of loose or damaged finish materials with fully functional emergency equipment such as exit signage, lights, emergency panels, fire alarm boxes, signage and communications equipment and maintain colors and design characteristics consistent with aesthetic requirements.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
18.7	Drainage	Subsurface drainage and pumping systems fully operational and clear of debris.	2 hrs	1 mo.	Regular inspection in accordance with the Highway and Rail Transit Tunnel Maintenance and Rehabilitation Manual, and the Tunnel, Operations, Maintenance, Inspection, Evaluation (TOMIE) Manual and the Specifications for the National Tunnel Inventory (SNTI).	Maintenance performed and documented per the Maintenance Management Plan (MMP) with flow rates established per design, free from blockage due to sedimentation or calcification and, fully functional pumping components and systems, screeds, and control and monitoring equipment.
18.8	Fire Protection	Fire protection systems such as but not limited to fire detection, alarm, notification and suppression systems fully functional and operational.	1 hr	3 mo.	Compliance with Maintenance Management Plan MMP. The plan shall be based on the Highway and Rail Transit Tunnel Maintenance and Rehabilitation Manual, Tunnel, Operations, Maintenance, Inspection, Evaluation (TOMIE) Manual, the Specifications for the National Tunnel Inventory (SNTI), and applicable NFPA standards. Life Safety preventative maintenance performed and reported bi-annually.	Fire protection systems functioning correctly 100% of the time and in full compliance with the MMP

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
18.9	Electrical Systems, regular & Emergency Lighting	Lighting system fixtures, lamps and control functioning to provide the intended illumination level, light output, lighting quality, duration and energy efficiency, for the location.	1 hr	3 mo.	Compliance with Maintenance Management Plan (MMP). The plan shall be based on the Highway and Rail Transit Tunnel Maintenance and Rehabilitation Manual, Tunnel, Operations, Maintenance, Inspection, Evaluation (TOMIE) Manual and the Specifications for the National Tunnel Inventory (SNTI).	Electrical and emergency lighting systems functioning correctly 100% of the time and in full compliance with the MMP
18.10	Electrical Systems, Fire / vehicle Detection and Alarm and emergency way-finding signage	Fire / vehicle detection and alarm systems provide the intended detection and notification functions including emergency way-finding signage.	1 hr	3 mo.	Compliance with Maintenance Management Plan (MMP). The plan shall be based on the Highway and Rail Transit Tunnel Maintenance and Rehabilitation Manual, Tunnel, Operations, Maintenance, Inspection, Evaluation (TOMIE) Manual, the Specifications for the National Tunnel Inventory (SNTI), manufacturer's recommendations, and NFPA 70B and 72. Preventative maintenance of fire alarm sources and testing per NFPA 70B, 72, 101, 110 & 111. Follow manufacturer's recommendations for maintenance and testing where requirements are more demanding. Continuous monitoring through self-system diagnostics and failure detection.	All fire alarm systems perform as designed and provide the intended level of protection with all detectors operating within manufacturer's tolerance for sensitivity and cleanliness. All inspections conducted and documented. All preventative maintenance performed and documented in accordance with the referenced standards.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
18.11	Electrical Systems, Communications including Radio Rebroadcast, 2-way Radio, public emergency message rebroadcast, voice alarm and public address, Telephone and CCTV, and all communication Elements identified in Section 12 (Cover MEP System) of Schedule 10	Communications systems serving their intended functions.	1 hr	3 mo.	Compliance with Maintenance Management Plan (MMP).The plan shall be based on the Highway and Rail Transit Tunnel Maintenance and Rehabilitation Manual, Tunnel, Operations, Maintenance, Inspection, Evaluation (TOMIE) Manual, the Specifications for the National Tunnel Inventory (SNTI), and manufacturer's recommendations. Operational tests using 2- way radio equipment and frequencies to match outside agencies served, weekly. Continuous monitoring through self-system diagnostics and failure detection. CCTV system compliance with NFPA 72 inspection and maintenance requirements for fire detection, where used.	All equipment operating in accordance with manufacturer's recommendations for actual conditions of use. 2-way radio system performance conforming with up-to-date Department specifications. Public emergency message rebroadcast performance conforming with relevant standards. Voice alarm and public address performance conforming with relevant standards. CCTV system complying with all requirements required to function as second means of fire detection. All inspections conducted and documented. All preventative maintenance performed and documented in accordance with the referenced standards and MMP. Free from database and communication system security breaches. Electronic retention of database files, back-ups and other stored media.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
18.12	Electrical Systems, Distribution – Normal, Essential & Emergency	Electrical system serving connected loads with intended capacity, voltage regulation, protection, control and monitoring.	1 hr	3 mo.	Compliance with Maintenance Management Plan (MMP). The plan shall be based on the Highway and Rail Transit Tunnel Maintenance and Rehabilitation Manual, Tunnel, Operations, Maintenance, Inspection, Evaluation (TOMIE) Manual, and the Specifications for the National Tunnel Inventory (SNTI), and manufacturer's recommendations. Preventative maintenance and testing of essential and Emergency sources per NFPA 110 and 111. Exercising of back-up generators under load where used as essential and Emergency sources, monthly. Exercising of ATS switches, semi-annually. Load testing of UPS systems where used as essential and Emergency source, monthly. Monitoring and Testing of individual battery cell condition, annually.	All elements of electrical systems distribution normal, essential and emergency functioning as designed 100% of the time.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
18.13	Command, Control and Monitoring System	Command, Control and Monitoring System provides intended function of control, monitoring, communication and visual display of all connected systems including integration with other systems.	1 hr	3 mo.	Compliance with Maintenance Management Plan (MMP). The plan shall be based on the Highway and Rail Transit Tunnel Maintenance and Rehabilitation Manual, Tunnel, Operations, Maintenance, Inspection, Evaluation (TOMIE) Manual, and the Specifications for the National Tunnel Inventory (SNTI). Follow manufacturer's recommendations for maintenance and testing where requirements are more demanding. Continuous monitoring through self-system diagnostics and failure detection.	All elements of Command, Control and Monitoring System functioning as designed 100% of the time.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
18.14	Electrical Systems, Grounding & LP	Grounding and lightning protection systems provide intended function and level of protection for equipment, structure and personnel protection.	2 hrs	3 mo.	Compliance with Maintenance Management Plan (MMP). The plan shall be based on the Highway and Rail Transit Tunnel Maintenance and Rehabilitation Manual, Tunnel, Operations, Maintenance, Inspection, Evaluation (TOMIE) Manual, the Specifications for the National Tunnel Inventory (SNTI), manufacturer's recommendations and NFPA 780. The fall of potential method shall be used to test the resistance to earth of all grounding electrode systems serving electrical services, lightning protection and alternate energy sources, every 5 years. The continuity of ground connections to remote earth shall be tested during replacement of equipment served or any major change of system configuration.	All elements of Grounding and lightning protection systems functioning as designed 100% of the time.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
18.15	Ventilation System	Ventilation system fully maintained, functional and operational.	2 hrs	3 mo.	Compliance with Maintenance Management Plan (MMP). The plan shall be based on the Highway and Rail Transit Tunnel Maintenance and Rehabilitation Manual, Tunnel, Operations, Maintenance, Inspection, Evaluation (TOMIE) Manual, the Specifications for the National Tunnel Inventory (SNTI), and manufacturer's recommendations. Life Safety preventative maintenance performed and reported bi-annually. Life safety components of the tunnel ventilation system tested annually, Verification of OCC activation and separately, local activation of tunnel ventilation life safety response, annually.	All elements of the ventilation system functioning as designed 100% of the time.
18.16	Cover electrical Supplies	Electricity supplies, feeder panels, transformers, cabinets, switches and fittings are electrically, mechanically and structurally sound and functioning	1 hr	1 mo.	Availability of supply of power and electricity to the cover systems, and in accordance with the Tunnel, Operations, Maintenance, Inspection, Evaluation (TOMIE) Manual.	A continuous availability level of 100% from metered source to all O&M equipment and facilities. Securely in place and free from damages or exposed wiring.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
18.17	Cover firefighting Water Supplies	Firefighting water supplies, plumbing, pipework and valves mechanically and structurally sound and functioning	1 hr	1 mo.	Availability of supply of firefighting water to the cover systems, and in accordance with the Tunnel, Operations, Maintenance, Inspection, Evaluation (TOMIE) Manual.	A continuous availability level of 100% to all firefighting equipment and facilities.
18.18	Plant rooms	Electricity supplies, panels, cabinets, switches, heating/cooling/air conditioning and fittings are electrically, mechanically and structurally sound and functioning	1 hr	3 mo.	Availability of equipment and systems to the cover systems, and in accordance with the Tunnel, Operations, Maintenance, Inspection, Evaluation (TOMIE) Manual.	A continuous availability level of 100% to all O&M equipment and facilities. Securely in place and free from damages or exposed wiring.
19.	**ITS AND ETC FACILITIES**					
19.1*	ITS and ETC elements installed by Developer	Fully functional and operational without damages.	24 hrs	48 hr	Operation records; Visual Inspection and/or as identified by Department	No instances of malfunction or damages to devices or equipment, other than planned outages that have prior written approval by the Department.
19.2*	Backbone communication and VTMS	Fully functional and operational without damages.	4 hrs	24 hr	Operation records; Visual Inspection and/or as identified by Department. Follow manufacturer's recommendations for maintenance and testing. Continuous monitoring through self-system diagnostics and failure detection.	No instances of communication or VTMS failures, other than planned outages that have prior written approval by the Department.

REF	ELEMENT	GENERAL REQUIREMENT	DEFECT REMEDY PERIOD		PERFORMANCE REQUIREMENTS	
			Cat 1 Immediate Action	Cat 2 Permanent Repair	MEASUREMENT CRITERIA	TARGET
19.3	ITS and ETC Equipment installed by Developer and Backbone communication	Developer to provide reporting on inefficiencies or malfunction of ITS and ETC equipment, including ramp meters, and backbone communication.	4 hrs	24 hr	ITS and ETC reporting log or records. Visual inspection and/or as identified by Department.	100% reporting and follow up reporting on equipment corrections, repairs and connections to communication lines to ETC System Integrator and CTMC.
19.4	ITS and ETC civil infrastructure, such as pullboxes, manholes, cabinets, foundations, ITS sign structures, poles.	Fully functional and operational without damages.	24 hrs.	1 mo.	Maintenance records. Visual Inspection.	100% of time.

*For the period commencing the operations of the ITS and/or Tolling Equipment installed by the Developer, up to two Calendar Years after Final Acceptance.

Appendix B – Courtesy Patrol Requirements

1.1 GENERAL REQUIREMENTS:

A. The location and limits of the patrols shall be the I-70 Mainline within the O&M Limits.

B. Developer shall patrol and monitor the Project within the O&M Limits every Calendar Day except for New Year's Day, Thanksgiving Day, and Christmas Day. The hours for patrol and monitoring shall be 6:30 am to 8 pm for weekdays, and 10am to 7 pm for weekends. Developer shall patrol and monitor regardless of weather conditions. Any extensions of operating hours due to Emergencies, Severe Weather Event or planned Special Events as identified by Developer and accepted by the Department, or as required by the Department, (up to 30 hours per Contract Year for all required vehicles, dispatch staff, and required personnel and equipment) shall be the responsibility of Developer.

C. Developer shall provide full time dedicated dispatch staff responsible for dispatch of Developer's Courtesy Patrol Vehicles when there are Incidents, accidents, or other events requiring the services of the Courtesy Patrol Vehicles. Developer shall also interface with the Department's Mile High Courtesy Patrol program. Developer's dispatch staff shall be co-located with the Department's CTMC dispatch staff, unless otherwise agreed by the Department. Developer's dispatch staff may also operate the CCMS as required in Section 3.2.3 of this Schedule 11 if Developer can demonstrate to the Department's satisfaction that both functions can be carried out as per the requirements of this Schedule 11.

D. Developer shall respond with vehicle to any calls on the Tolled Express Lane(s) or General Purpose Lane(s) within fifteen (15) minutes of being dispatched from the Department's call center or authorized Department representative. All vehicles shall be towed to a designated Drop Site. Drop Sites shall be open at all times during the patrol and monitoring hours set out in Section 1.1.B. of Appendix B of this Schedule 11. Furthermore, Incidents or accidents will be moved to the nearest shoulder, or a location that is safe to all, to open all lanes of the Tolled Express Lane(s) and General Purpose Lanes. Developer shall use flat-bed or wrecker tow trucks to remove vehicles from the scene, and these trucks shall meet the requirements in this Schedule 11 and contain all the equipment that is set forth by the Colorado PUC. No gas, tire change, or jump start shall be given to anyone in the Tolled Express Lane(s) and General Purpose Lanes due to the danger of the location. Cell phones shall be provided for emergency uses only.

E. Developer shall provide the Courtesy Patrol Service vehicles needed to perform the assistance services mentioned above.

F. Developer shall comply with all Laws regarding travel on the shoulders of any highway areas.

1.2 SPECIFIC WORK REQUIREMENTS:

A. Work Requirements:
Developer shall provide such services according to the following requirements:
1. All services shall, at all times, be provided by Developer free of any charge to, or payment from, the disabled motorists or any other person or entity, public or private. Developer shall refuse any offers of other payment or gratuities of any kind.

2. Developer shall provide the services to disabled motorists only after Developer explains to the motorist the services to be provided (including the Drop Site, and that the services are free of charge), and only after requesting and obtaining the motorist's consent to such services. The services may be refused by the motorist at any time.
3. Subject to the motorist's consent, it is preferable for Developer to move the vehicle from traffic or from the shoulder (whichever is applicable) off of the highway to a Drop Site before providing additional services, in order to eliminate any hazard or congestion that might result if Developer provided service in traffic or on the shoulder.
4. Developer shall move a disabled vehicle that is in traffic to the shoulder of the highway and provide limited assistance to the vehicle on the shoulder, as an alternative to having the vehicle moved from the highway to a Drop Site.
5. Developer shall provide service(s) chosen by the motorist; however, Developer shall not provide any service not described herein.
6. Developer shall report all occurrences causing traffic congestion, all Incidents requiring Developer to be in and out of service, and each beginning and ending shift to the Department when the event occurs.

B. Drop Sites:
Developer shall obtain the right to use suitable "Drop Sites" near the Project.

A "Drop Site" is defined as any business location to which the Developer can tow (and leave) the disabled vehicle, and from which the motorist of the disabled vehicle can safely make arrangements to be picked up and/or to have the vehicle repaired, subject to the specific conditions described below.

1. Specific Drop Site Conditions

Drop Sites shall satisfy all of the following specific conditions:

a. The site(s) shall be located as close as reasonably possible to the highway, and within the Project limits.
b. The sites shall be well lighted and must have a working phone (pay or business) available to the public on the premises.
c. It is preferable, but not required, that each business Drop Site be able to provide assistance to the disabled vehicle, e.g. full service gas stations, tire stores, or other repair facilities.
d. Businesses used as Drop Site(s) must allow a disabled vehicle to remain on site, free of charge, for at least three hours, in order to provide sufficient time for the motorist to make suitable arrangements.
e. Developer shall have written evidence from the owner/operator of the business of Developer's right to use that business as a Drop Site.

2. General Drop Site Requirements

Developer shall also comply with the following general requirements concerning Drop Sites:

a. Developer shall not receive any payment or compensation of any kind from such businesses in connection with, or as a result of, the program services, including for any repairs made to the vehicle by the business.

b. The particular Drop Sites used by Developer may vary from hour to hour, depending on the conditions at each site during the hours of operation of the patrol.

c. Developer shall provide a list of Drop Sites, listed by hour each Drop Site is available for use, to the Colorado State Patrol and to any local law enforcement agency with jurisdiction over such sites immediately upon commencement of the O&M Work. Developer shall also provide any modification of such list to such agencies and the Department within one (1) working day of that modification.

d. As described above, Developer shall obtain the motorist's consent to move the motorist and the disabled vehicle to a Drop Site. Developer shall explain to the motorist that they have only three hours at the Drop Site to make suitable arrangements or their vehicle can be towed away at their expense.

e. The Department shall not be responsible for any motorist injury or vehicle damage resulting from Developer's selection or use of a particular Drop Site.

f. Developer shall not leave a motorist and/or a disabled vehicle at a particular Drop Site if, under the circumstances, that Drop Site presents an unreasonable risk of harm to the motorist or vehicle.

C. Work Prohibitions:

The success of this Courtesy Patrol program relies heavily on public relations and on the public's perception of the program's purposes and operation and, therefore, on the conduct of Developer and its operators in performing the program services.

The Department has determined that all of the actions listed below would create a negative public image, present a problem for local law enforcement concerning traffic management, and interfere with the operation and success of the program. Therefore, at all times during the performance of the Courtesy Patrol Services, Developer, its operators, and its employees shall not:

1. Solicit membership in any commercial/business organization or association, including vehicle repair or service associations.
2. Recommend or pressure motorists to use any towing service other than the Courtesy Patrol for a disabled vehicle.
3. Recommend, or pressure motorists to use, any business (including Drop Site businesses) for service on a disabled vehicle.
4. Radio for an alternative towing service, except when specifically asked by a motorist to do so, after the free Courtesy Patrol Services have been offered and explained to the motorist.
5. Tow a vehicle to a location other than the shoulder of the highway segment, or to the designated Drop Site nearest the vehicle location.
6. Interfere with a private sector towing service that is already present at the immediate location of a disabled vehicle. When Developer arrives at the vehicle in such circumstances, Developer should stop and offer assistance only to the motorist.
7. Patrol near another Courtesy Patrol Services vehicle off the Project limits.
8. Stay at the scene of an accident on the highway segment after the local law enforcement authorities have arrived at the scene, unless requested by local authorities to assist at the accident scene.
9. Refuse the orders of a law enforcement officer, or any directions the Department, or his/her designee, as provided to the Developer.

10. Tow a disabled vehicle while the motorist, or other occupants of the disabled vehicle, are in the towed vehicle, or leave any unattended occupants on the freeway while towing the vehicle. Patrol staff shall contact Developer dispatcher and request alternate transport of such occupants (e.g. other Courtesy Patrol Service vehicle or police vehicle).
11. Accept tips, money, or any other payment or compensation of any kind from the disabled motorists for the services provided.
12. Patrol with any other person in the patrol vehicle, unless that person is directly associated with the Developer.
13. Commit traffic violations of any kind including without limitation, speeding, or illegal lane changes.
14. Perform any act that provides an unfair competitive advantage to any private tow service.
15. Use the vehicle's yellow warning lights other than as authorized by law. The yellow warning lights shall be activated only when the vehicle is operating on the roadway to eliminate hazards to other traffic, as required by Colorado Revised Statutes 42-4-214.
16. Complete services as a private tow service when services were initiated as Courtesy Patrol Service. This includes staying at the scene of an Incident until the end of patrol hours in a Developer assigned shift, removing Courtesy Patrol Service signs, and then performing services as a private tow service for a fee. Courtesy Patrol Service signs shall be put in-place before entering, and removed and upon leaving, the freeway.

Developer will notify the Department of any of its operators/employees who perform such actions and Developer shall take immediate action to remove such operators/employees from further performance of program services.

D. Patrolling:
Developer shall dispatch the appropriate number of Courtesy Patrol Service vehicles to patrol the Project and to meet the response timeline as set out in Section 1.1.D of this Appendix B. The operators/drivers of patrol vehicles shall be sufficiently spaced to adequately provide continuous coverage. The Courtesy Patrol Service vehicle(s) shall patrol the designated highway segment for disabled vehicles in need of assistance and, upon finding such vehicles, remove such vehicles from the traveled portion of the highway segment and/or providing assistance to such vehicles as quickly as possible.

When a disabled vehicle Incident/accident is discovered, the patrol vehicle shall respond as follows:

1. Arriving At a Disabled Vehicle on the Shoulder:

   When a Developer operator finds a disabled vehicle on the shoulder of a highway segment, the operator shall pull directly behind the vehicle. However, the operator shall not turn on the towing vehicle's yellow warning lights unless the disabled vehicle or the towing vehicle poses a hazard to other motorists.

   The operator shall communicate data collection requirements to the CTMC dispatch for detection (if the operator is the first to identify the Incident) and verification (location of the Incident based on the initial radio report).

The operator shall then exit the patrol vehicle, distribute Department's program brochure, and offer the program services to the motorist. Following directives provided by the Department, the operator shall explain to the motorist:

a. The Courtesy Patrol is a Department program;
b. The program is publicly funded;
c. The services are free of charge to the motorist;
d. Quick clearance Benefits;
e. The motorist has the option to refuse or accept the service;
f. Only particular services may be provided to the motorist (as defined below);
g. The nature of the Drop Site(s) available;
h. The motorist has the option to leave his/her vehicle on the shoulder of the freeway or to be taken to a Drop Site; and
i. Law enforcement may provide authorization to override a motorist's refusal to move the vehicle.

Developer's operator shall then request the motorist's consent, to such service, and must obtain such consent, in writing, before providing service.

The Developer's operator shall offer to allow the motorist to use the mobile telephone equipment in the Courtesy Patrol Service vehicle, and the motorist shall be allowed up to five minutes of local calls at no charge to the motorist.

If the motorist refuses the service, Developer's operator shall contact the CTMC dispatch to determine if the operator should leave the scene to continue patrolling or protect the vehicle until law enforcement arrives.

If the motorist consents to service and, if the operator can make the vehicle operational by providing the limited assistance available to the Developers operator, then the operator shall proceed as follows:

a. If the motorist does not consent to have the vehicle moved, and the operator can render service on the shoulder with minimal hazards created, then the operator will render such service on the shoulder for a period not to exceed 10 minutes. If the operator cannot make the vehicle operational within 10 minutes then, with the motorist's consent, the operator shall move the disabled vehicle and motorist to the Drop Site nearest the location of the vehicle. If the motorist does not consent to moving the disabled vehicle and the operator has offered all available options of the Courtesy Program to the motorist, the operator shall notify his/her supervisor and the appropriate law enforcement agency then leave the scene immediately and continue patrolling, unless dispatch and/or law enforcement direct them to stay on scene.
b. If the motorist does consent to have the vehicle moved, it is recommended that the vehicle be moved to the nearest Drop Site to provide assistance.

After the vehicle is moved to the shoulder or if the operator provides assistance on the shoulder the operator shall notify CTMC dispatch that the lane is clear. When the disabled vehicle and the motorist are moved safely to the Drop Site and/or assistance provided at the Drop Site, the operator shall notify the CTMC dispatch that the Incident has been removed from the roadway and shoulder. The operator shall immediately return to patrolling.

2. Arriving At a Disabled Vehicle in Traffic:

When Developer's operator finds a disabled vehicle in traffic, the operator shall pull directly behind the vehicle as soon as possible, and turn on the tow vehicle's yellow warning lights.

Developer's operator shall communicate data collection requirements to the CTMC dispatch for Detection (if the operator is the first to identify the Incident) and Verification (location of the Incident based on the initial radio report).

Developer's operator shall then ask for the motorist's consent to move the disabled vehicle, and the motorist, to a Drop Site (first choice), or to the shoulder of the highway segment (second choice). If the motorist consents, the operator shall take appropriate action and inform the CTMC dispatcher of the Incident's status, when the blocked lane has been cleared, and when the Incident has been removed from the roadway and shoulder. Developer's operator shall then exit the vehicle and explain the Department's program to the motorist, and the services available.

If the motorist refuses, the operator shall immediately contact local law enforcement to report the disabled vehicle in traffic, and the operator shall stay directly behind the disabled vehicle with yellow warning lights activated until the vehicle is moved from traffic or until a local law enforcement officer arrives. The operator shall follow the instructions of the local law enforcement officer and inform the CTMC dispatcher of the Incident's status.

3. Arriving At an Accident:

When the operator finds an accident on the highway, the operator shall pull directly behind the vehicle(s) as soon as possible and turn on the yellow warning lights. The operator should then carefully exit the patrol vehicle and discuss the situation with the motorist(s).

The operator shall communicate data collection requirements to the CTMC dispatch for detection (if the operator is the first to identify the Incident) and verification (location of the Incident based on the initial radio report).

If there are injuries, the operator shall not attempt to move the vehicle(s), but rather immediately call 911 and discuss further action with local law enforcement. The operator shall follow all instructions made by local law enforcement and inform the CTMC dispatcher of the Incident's status.

If there are no injuries (accident involves only property damage) but the vehicle(s) cannot be safely driven, the operator shall explain the program to the motorists and ask the motorist's consent to move the vehicles from the traveled portion, median, or ramp of the highway and inform the CTMC dispatcher of the Incident's status.

If the motorist does not consent, then the operator shall stay immediately behind the vehicles until local law enforcement arrives, shall assist law enforcement as requested, and inform the CTMC dispatcher of the Incident's status.

If the motorist consents, the operator shall request additional Courtesy Patrol assistance before taking further action. (The operator should not move one of the vehicles if that means the other disabled vehicle will remain alone in traffic, but instead protect the accident scene by staying directly behind both vehicles until assistance arrives). If the motorists have already fulfilled the requirements of Colorado Revised Statutes 42-4-1603, concerning exchanging identification/information, then when assistance arrives, the operator(s) should move the disabled vehicles to the nearest Drop Site if damages appear to total less than (indexed). If the motorist(s) have not exchanged such information, then the operator(s) shall move the vehicles to the nearest suitable location for that purpose in accordance with C.R.S. 42-4-1602(2).

Under no circumstances shall an operator attempt to repair an accident vehicle in an attempt to make it mobile.

The operator shall communicate data collection requirement to the CTMC dispatch when the Incident has been moved from the travel lanes and when the Incident has been removed from the roadway and shoulder.

1.3 SPECIFIC EQUIPMENT REQUIREMENTS:

The Courtesy Patrol Service roving fleet shall contain at a minimum 50% towing vehicles, the remainder of the fleet (maximum of 50%) shall be motorist assistance vehicles.

A. The Courtesy Patrol Service vehicles shall be equipped, at a minimum, with the following:

Towing Vehicles:

1. Wheel lift towing equipment, including safety straps with a minimum lift rating of 3,000 pounds;
2. Hydraulic boom lift capability with a static rating of 5,000 pounds;
3. Winch cable with an 8,000 pound rating on the first layer of cable;
4. Towing slings rated at 3,000 pounds;
5. Tow chains of 5/16" alloy or OEM specs, and J.T. hook assembly;
6. Yellow/amber warning lights with front to rear (360 degree) directional flashing, with on/off switch in cab;
7. Power outlets ("hot boxes"), front mounted , with outlets compatible with 12-volt booster cables;
8. Heavy duty, 60+-amp battery;
9. Two-way radio communications with base office;
10. Cellular telephone;
11. Cab Lighting;
12. Rear work lights;
13. Safety D-ring on rear of truck;
14. Floor jack on rollers with a 2-ton rating;
15. All equipment necessary to operate the towing vehicles during winter driving conditions (i.e. chains, studded snow tires, etc.);
16. Wrap around push bumpers; and
17. Automated Vehicle Location (AVL).

Motorist Assistance Vehicles:

1. Winch cable with a 12,000 pound rating on the first layer of cable;
2. Tow chains of 5/16" alloy or OEM specs, and J.T. hook assembly;
3. Two (2) tow straps rated at 53,000 pounds, minimum;
4. Yellow/amber warning lights with front to rear (360 degree) directional flashing, with on/off switch in cab;

5. Power outlets ("hot boxes"), front mounted , with outlets compatible with 12-volt booster cables;
6. Heavy duty, 60+-amp battery;
7. Two-way radio communications with base office;
8. Cellular telephone;
9. Cab Lighting;
10. Rear work lights;
11. Safety D-ring on rear of truck;
12. Floor jack on rollers with a 2-ton rating;
13. All equipment necessary to operate the motorist assistance vehicles during winter driving conditions (i.e. chains, studded snow tires, etc.);
14. Wrap around push bumpers;
15. Automated Vehicle Location (AVL); and
16. Child restraints in accordance with C.R.S. 42-4-236.

B. In addition to the specific vehicle equipment described above, at the start of a shift, the Courtesy Patrol Service vehicles shall contain each of the following items in order to ensure adequate service to disabled vehicles. These items shall be promptly replenished prior to the next shift, and as needed:

Towing Vehicle:

1. Unleaded gasoline (5 gallons) available in an easy access gas transfer system;
2. Safety chains measuring a minimum of 5 ft. (1 each);
3. Radiator water (5 gallons). Anti-freeze shall be added to the water when needed to keep the water in a liquid form;
4. Four way lug wrench (metric) (1 each);
5. Four way lug wrench (standard) (1 each);
6. Rechargeable air bottle (100 psi capacity), hoses and fittings to fit tire valve stems (1 each);
7. Flashlight and spare batteries (1 each);
8. Booster cables, 25 ft. long minimum, 3-gauge copper wire with heavy-duty clamps with one end adapted to truck's power outlets (1 set);
9. Funnel, multipurpose, flexible spout (1 each);
10. 36-inch highly visual orange traffic cones with reflectorized bands (5 each);
11. Reflector vest for the operator (1 each) (Type III night and day time);
12. First aid kit, 16 units (1 kit);
13. Fire extinguisher, 1OABC (1 each);
14. Hand broom (1 each);
15. Snow shovel (1 each);
16. Traction sand (20lbs);
17. Flares, 30 minute (3 each);
18. Reflective Triangular Warning devices (3 each);
19. Dry floor; and
20. Personal protective equipment such as gloves, glasses, etc.

Motorist Assistance Vehicle:

1. Unleaded gasoline (5 gallons) available in an easy access gas transfer system;
2. Safety chains measuring a minimum of 5 ft. (1 each);
3. Radiator water (5 gallons). Anti-freeze shall be added to the water when needed to keep the water in a liquid form;
4. Four way lug wrench (metric) (1 each);
5. Four way lug wrench (standard) (1 each);
6. Toolbox containing:

Screwdrivers: Standard 1/8, 3/16, ¼, 5/16, (1 each), Phillips head #1 and #2 (1 each), and
Star Driver (1 set),
Needle nose pliers (1 pair),
Adjustable rib joint pliers—2 inch minimum capacity (1 pair),
Adjustable wrenches, 8 inch (1 each) and 12 inch (1 each),
5 pound hammer (1 each)
Rubber mallet (1 each)
Electrical tape (20 yards)
Duct Tape (20 yards)
Tire pressure gauge (1 each)
Mechanic's wire (25 foot roll)
Bolt cutter—24 inch or larger (1 pair), and
Complete set of box wrenches, metric and standard (1 set each).

7. Rechargeable air bottle (100 psi capacity), hoses and fittings to fit tire valve stems (1 each);
8. Flashlight and spare batteries (1 each);
9. Booster cables, 25 ft. long minimum, 3-gauge copper wire with heavy-duty clamps with one end adapted to truck's power outlets (1 set);
10. Funnel, multipurpose, flexible spout (1 each);
11. 36-inch highly visual orange traffic cones with reflectorized bands (5 each);
12. Reflector vest for the operator (1 each) (Type III night and day time);
13. First aid kit, 16 units (1 kit);
14. Drinking water, individually sealed bottles, minimum 16 oz. (12 each);
15. Fire extinguisher, 1OABC (1 each);
16. Hand broom (1 each);
17. Snow shovel (1 each);
18. Traction sand (20lbs);
19. Flares, 30 minute (3 each);
20. Reflective Triangular Warning devices (3 each);
21. Dry floor; and
22. Personal protective equipment such as gloves, glasses, etc.

A. Developer's operators shall wear Department approved uniforms. Uniforms shall include, at a minimum, shirts covering the chest and armpits, full length pants, and protective footwear. Developer shall submit uniform samples for review and Acceptance of the Department prior to beginning work and in the event changes are proposed. The Developers operators shall wear high visibility safety apparel. These items shall be provided and maintained by Developer. Developer's operators shall wear hats with Developer logos at all times while patrolling.

B. Developer's operators shall not smoke during patrol operations and/or while assisting motorists.

C. Developer's operators shall not use, be under the influence of, or have in their possession any alcohol, marijuana, or illegal substances during patrol operations. Operators shall not carry firearms, or any device whose primary function is as a weapon, either on their person or in the towing vehicle.

D. Developer's operators shall express a positive, helpful, cooperative attitude when dealing with motorists.

E. Any new operator assigned by Developer to the program, shall be properly trained in the courtesy patrol program and field operations. The new operator shall accompany a current operator, experienced with the Mile High Courtesy Patrol, for at least five shifts prior to patrolling a highway.

F. Any new operator assigned by the Developer to the courtesy patrol program shall complete required Developer training, which shall be consistent with training on the Mile High Courtesy Patrol program, prior to patrolling a highway segment.

1.4 GENERAL EQUIPMENT AND OPERATOR REQUIREMENTS:

Developer shall comply with the general equipment and operator requirements described in this section.

Developer shall provide the Courtesy Patrol Service vehicles needed to meet the Performance Requirements in this Schedule 11. The Courtesy Patrol Service vehicle(s) shall meet the following requirements at all times during the O&M Period During Construction and Operating Period.

A. Tow Trucks:
Tow truck shall be Colorado licensed, including Public Utility Commission licenses, and be an insured Class A tow truck with a minimum gross vehicle rating of 10,000 pounds, dual wheel chassis and four (4) ton recovery equipment rating. Flatbed "roll back" service trucks may be used in-lieu-of boom type wrecker trucks. Flatbed trucks must be equivalent in capacity to specified boom type trucks (excluding vertical lift) to safely handle the scope of work.

B. Motorist Assistance Vehicle:
Motorist assistance vehicles shall be at minimum, a full size, one ton crew cab 4 door, long bed pickup truck with a minimum gross vehicle rating of 10,000 pounds, insured, equipped with and capable of carrying the equipment specified.

C. All Courtesy Patrol Service vehicles shall be completely operational, in sound mechanical condition, and in full compliance with applicable legal requirements at all times, for the performance of the program services.

D. The Courtesy Patrol Service vehicle's exterior shall be reasonably clean at the beginning of each shift, free of road grime, grease, and articles/equipment not needed for the program. No body damage and/or broken glass shall be permitted on the vehicle at the start of a shift.

E. The inside of the vehicle shall be kept clean. The seat and floor shall be free of dirt, grease and any other substance that may transfer to someone's clothing by contact. The seat shall not be torn. Exposed springs, seat stuffing or damaged upholstery shall not be permitted. Torn dashboards, missing screws, hanging hoses or wire, or any other unsightly items inside the cab shall not be permitted.

F. Developer shall maintain a backup Courtesy Patrol Service vehicle at all times, and shall use the backup to replace any disabled or otherwise unavailable Courtesy Patrol Service vehicle.

G. The towing vehicles and motorist assistance vehicles must be a single color, as Accepted by the Department.

H. The vehicle shall display a 15 inch by 26 inch (minimum) Courtesy Patrol logo sign on each door at all times during performance of program services. Developer shall have signs Accepted by the Department to verify logo and branding consistency with the Department's Mile High Courtesy Patrol Program. Developer name, phone number, and/or logo shall not be permitted anywhere on the vehicle, unless completely covered with the Courtesy Patrol Service signs during performance of program services. All private information including, but not limited to logos, contact information, etc. shall be completely covered at all times while a vehicle is in service.

I. The Courtesy Patrol Service signs shall be removed from the vehicle at all times when the vehicle is used for purposes other than the Courtesy Patrol Service program. Developer shall cover or remove future branding/sponsorship information when vehicles are not in service for Courtesy Patrol Service activities.

J. Developer shall only be required to perform services up to the capacities of their equipment. If situations are encountered outside of their capacities, the operators shall:

1. If on shoulder, offer use of cellular phone.
2. If in roadway, alert motorists by activating yellow warning lights and contacting the responsible law enforcement agency.
3. When a police officer is at the scene, return to patrolling, unless otherwise ordered.
4. When cellular phones are provided, their usage must be reasonable to the situation. Developer shall have the right to control unreasonable requests (such as calls outside the 303, 720, or 719 Area Codes). Developer shall provide the cellular phone numbers to the Department upon request.

1.5 SAFETY OF VEHICLE OCCUPANTS:

Developer shall make provisions to transport all occupants of a disabled vehicle to the shoulder of the road or to the Drop Site. Under no circumstances are any occupants or pets to be left unprotected in the disabled vehicle while the vehicle and operator are transported to the shoulder of the road or a Drop Site

1.6 RADIO PROCEDURES:

The Department has developed and will provide radio procedures for use by the Developer's operators, unless Developer has developed radio procedures that are otherwise Approved by the Department. The Department may periodically update procedures, where such updated procedures will be provided to Developer in writing. A schedule for implementation of the updated procedures will be provided by the Department for Developer to follow, unless alternate arrangements are Approved by the Department.

Developer shall provide all the radios required for the Courtesy Patrol Services program within the Project.

1.7 MAIL IN CARDS:

Developer shall give every assisted motorist a mail-in card, and a program brochure. The card will aid the Department in tracking those services provided to the motorist and the public's reaction to the program. The Department will provide Developer with the mail-in cards and program brochures. If mail-in cards and/or brochures are updated, Developer shall distribute the most recent version.

1.8 PAPERWORK:

Developer shall be required to complete an electronic log of each motorist assist and a log of total miles driven each shift for each operator. Motorist assist logs will also include data collection points of detection, verification, lane clearance, and roadway clearance times. Developer's vehicles that are required to use Express Toll Lanes shall also complete a toll log. The logs shall be accurate and completed at the end of each shift. Developer shall submit these logs electronically through the AVL system in chronological order for each operator.

1.9 TRAINING AND OPERATIONAL MEETINGS:

All operators shall receive orientation training provided by the Developer and Accepted by the Department, prior to the operator performing Courtesy Patrol Services duties. Developer shall not allow operators not having this training to perform any duties of the Courtesy Patrol Services program.

Appendix C – I-70 Snow Removal Survey

Appendix C

I-70 Snow Removal Survey

Notification No._____Date _____

Route _____Begin MP_____Interchanges? YONO

Part 1 – Traction Control Survey - Sample DURING the storm – at least 2 hours after start of precipitation

Roadway Treatment: Outcome of Sanding & Anti/Deicing

Condition indicator: Presence of traction due to bare pavement from anti/deicing chemical application or presence of sand on an icy surface. Entire highway plus emphasis areas are defined in PD 1055.2 to include bridges, hills, curves and intersections.

Outcome Measurement: Percent (%) of traction on traveled way

☐ Anti/deicer Treatment

☐ Sand Treatment

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0 <50% of Emphasis Areas

1 >50% of Emphasis Areas (Curves, Hills, Intersections)

2 Emphasis Areas Only

3 All Emphasis Areas & >50% of Remaining Areas

4 Entire Area Bare Due to Deicer or Entire Area Sanded

Circle One Only

PART 2 – PRECIPITATION EVENT

Precipitation Start Date

Precipitation Start Time

Precipitation End Date

Precipitation End Time

Bare Pavement Date

Bare Pavement Time

Report time in 24 hour time format

Elapsed Time (Hours)

(note: elapsed time = # of hours between precipitation end date/time and bare pavement. If bare pavement is reached before precipitation end date/time, enter 0)

Appendix D - O&M Work Responsibility for Structures

Existing Structure No.	New Structure No.	Structure Location and Description	Operations and Maintenance Responsibility (O&M Period During Construction)	Operations and Maintenance Responsibility (Operating Period)
E-16-MS E-16-MR	N/A	I-70 westbound over I-25 I-70 eastbound over I-25	Developer (Limited O&M Work)	Developer (Limited O&M Work)
E-17-NU E-17-NT	N/A	I-70 westbound over Lincoln Street I-70 eastbound over Lincoln Street	Developer (Limited O&M Work)	Developer (Limited O&M Work)
E-17-UP E-17-UW E-17-UQ E-17-UX	N/A	I-70 eastbound over Washington Street, South Platte River I-70 westbound over Washington Street, South Platte River Washington Street eastbound entrance ramp over South Platte River Washington Street westbound exit ramp over South Platte River	Developer (Limited O&M Work)	Developer (Limited O&M Work)
E-17-UR E-17-UU E-17-UV	N/A	I-70 eastbound over BNSF I-70 westbound over BNSF Washington Street westbound exit ramp over BNSF	Developer (Limited O&M Work)	Developer (Limited O&M Work)
E-17-UY E-17-US	E-17-AEU E-17-AEV	I-70 westbound over Brighton Boulevard I-70 eastbound over Brighton Boulevard	Developer	Developer
E-17-FX	N/A	I-70 Viaduct (Brighton Boulevard to Colorado Boulevard)	Developer	N/A
E-17-Z	N/A	UPRR Bridge under I-70	Developer	N/A
N/A	E-17-AEW E-17-AEX	UPRR over I-70 UPRR Service Road over I-70	Developer (at completion of Milestone 3, and excluding ballast, tracks, and railroad signals)	Developer (excluding ballast, tracks, and railroad signals)

Existing Structure No.	New Structure No.	Structure Location and Description	Operations and Maintenance Responsibility (O&M Period During Construction)	Operations and Maintenance Responsibility (Operating Period)
N/A	MISC-E-17-IT	Sanitary Sewer Bridge over I-70 (at York Street)	Developer (at completion of Milestone 3)	Developer
N/A	E-17-AEY	York Street over I-70	Developer (at completion of Milestone 3, and as per Section 2.2.2 of this Schedule 11)	Developer (as per Section 3.2.2 of this Schedule 11)
N/A	MISC-E-17-IU	Storm Sewer Bridge over I-70 (at York Street)	Developer (at completion of Milestone 3)	Developer
N/A	E-17-AEZ	Josephine Street over I-70	Developer (at completion of Milestone 3, and as per Section 2.2.2 of this Schedule 11)	Developer (as per Section 3.2.2 of this Schedule 11)
N/A	E-17-AEL	Cover (Columbine to Clayton)	Developer (at completion of Milestone 3, and as per Section 2.2.2 and Section 3.2.3 of this Schedule 11)	Developer (as per Section 3.2.2 and Section 3.2.3 of this Schedule 11)
N/A	E-17-AEN	Fillmore Street over I-70	Developer (at completion of Milestone 3, and as per Section 2.2.2 of this Schedule 11)	Developer (as per Section 3.2.2 of this Schedule 11)
N/A	E-17-AEO	Steele Street over I-70	Developer (at completion of Milestone 3)	Developer
N/A	E-17-AEP	Cook Street over I-70	Developer (at completion of Milestone 3, and as per Section 2.2.2 of this Schedule 11)	Developer (as per Section 3.2.2 of this Schedule 11)
N/A	E-17-AFA	BNSF Market Lead over I-70	Developer (at completion of Milestone 3, and as per Section 2.2.2 of this Schedule 11)	Developer (excluding ballast, track, and railroad signals)
N/A	E-17-AFC	Monroe Street over I-70	Developer (at completion of Milestone 3, and as per Section 2.2.2 of this Schedule 11)	Developer (as per Section 3.2.2 of this Schedule 11)

Existing Structure No.	New Structure No.	Structure Location and Description	Operations and Maintenance Responsibility (O&M Period During Construction)	Operations and Maintenance Responsibility (Operating Period)
E-17-HU E-17-HT	E-17-AFD	Colorado Boulevard over I-70	Developer (as per Section 2.2.2 of this Schedule 11)	Developer (as per Section 3.2.2 of this Schedule 11)
E-17-HY E-17-HZ	E-17-AFF E-17-AFG	I-70 westbound over Dahlia Street I-70 eastbound over Dahlia Street	Developer	Developer
E-17-HW E-17-HX	E-17-AFH E-17-AFI	I-70 westbound over Holly Street I-70 eastbound over Holly Street	Developer	Developer
E-17-GC E-17-GD	E-17-AFJ E-17-AFK	I-70 westbound over Monaco Street I-70 eastbound over Monaco Street	Developer	Developer
N/A	E-17-ADT	N Stapleton Drive over Denver Rock Island Railroad	Developer (at completion of Milestone 2, and as per Section 2.2.2 of this Schedule 11)	Developer (as per Section 3.2.2 of this Schedule 11)
E-17-EW E-17-DF	E-17-AFN E-17-AFO	I-70 westbound over Denver Rock Island Railroad I-70 eastbound over Denver Rock Island Railroad	Developer	Developer
N/A	E-17-ADU	Quebec eastbound exit ramp over Denver Rock Island Railroad	Developer	Developer
E-17-GA E-17-GB	E-17-AFQ E-17-AFR	I-70 westbound over Quebec Street I-70 eastbound over Quebec Street	Developer	Developer
E-17-AER	N/A	I-70 over Sand Creek	Developer	Developer
E-17-KR	E-17-AFS	Eastbound I-270 over I-70	Developer	Department
E-17-AEF	N/A	Central Park Boulevard over I-70	Local Agency	Local Agency
E-17-AED	N/A	I-70 westbound entrance ramp from Central Park Boulevard	Developer (Limited O&M Work)	Developer (Limited O&M Work)

Existing Structure No.	New Structure No.	Structure Location and Description	Operations and Maintenance Responsibility (O&M Period During Construction)	Operations and Maintenance Responsibility (Operating Period)
E-17-AEC	N/A	Eastbound I-270 to I-70 eastbound ramp	Department	Department
E-17-VD	N/A	I-70 over Havana Street	Developer	Developer
E-17-VE	N/A	I-70 over UPRR spur track (near Havana Street)	Developer	Developer
E-17-IQ	E-17-AFT E-17-AFU	I-70 westbound over Peoria Street I-70 eastbound over Peoria Street	Developer	Developer
E-17-UT	N/A	Northbound I-225 ramp to westbound I-70	Department	Department
E-17-SW	N/A	Westbound I-70 ramp to southbound I-225	Department	Department
E-17-MV	N/A	Chambers Road over I-70	Department	Department
E-17-RR	N/A	Ramp from Chambers Road to I-70 eastbound (over I-70 eastbound ramp to northbound Pena Blvd)	Developer (Limited O&M Work)	Developer (Limited O&M Work)
E-17-RS	N/A	Ramp from westbound I-70 to Chambers Road (over I-70 westbound ramp from southbound Pena Blvd)	Developer (Limited O&M Work)	Developer (Limited O&M Work)
E-17-RT	N/A	Northbound Pena Blvd over I-70	Local Agency	Local Agency
E-17-MY	N/A	Tower Road over I-70	Department	Department

Schedule 12
Handback Requirements

1. General Handback Requirements

a. Developer shall hand back the Project to the Enterprises on the Expiry Date such that as at the Expiry Date:

i. for each Element, the applicable Target as set out in the Performance and Measurement Table in Appendix A-2 to Schedule 11 (*Operations and Maintenance Requirements*) is met or exceeded;

ii. for each Residual Element, the Residual Life at Handback of such Element meets or exceeds its Residual Life Minimum Requirement;

iii. for each Element, all Renewal Work identified as needing to be performed in accordance with the most recent Accepted Renewal Work Plan, and following the identification of Category 1 Defects or Category 2 Defects affecting such Element within the 12 months prior to the Expiry Date, has been completed; and

iv. for each Renewal Element, Developer has demonstrated through the Final Handback Inspection Report that, from the time of its last reconstruction, rehabilitation, restoration, renewal or replacement, such Element has a Useful Life that meets or exceeds its Useful Life Baseline Requirement.

b. The Handback Requirements and the Developer's other obligations under this Schedule 12 do not apply to Elements within or forming part of the Limited O&M Work Segments.

2. Specific Handback Requirements

2.1. Bridge Decks

a. The Residual Life Methodology used by Developer for calculating the Residual Life of bridge decks shall, at a minimum, include a prediction of deterioration due to reinforcement corrosion over the duration of the Residual Life Minimum Requirement based on information obtained during the Term, including as reflected in or by:

i. the Durability Plan;

ii. routine inspections;

iii. Renewal Work Plans;

iv. Renewal Work Schedules; and

v. non-routine and Specialist Inspections.

b. Developer shall ensure that quantitative data used in the prediction of Residual Life for all Residual Elements is representative and is gathered in accordance with the Durability Plan requirements and the relevant inspection requirements.

3. Developer Deliverables and Handback Activities

3.1. Introduction

a. Developer shall submit each of the Handback Deliverables to the Enterprises no later than the date specified in the "End" column against such deliverable in Table 12-1 (*Schedule of Handback Deliverables and Activities*) below.

b. Table 12-1 below also lists certain activities associated with the preparation of the Handback Deliverables and (subject to any express provisions of this Schedule 12 that stipulate more specific timing requirements) the required timing and/or duration of such activities.

Table 12-1 Schedule of Handback Deliverables and Activities

	Months to Expiry Date		
Handback Deliverable/Activity	**Start**	**End**	**Duration (Months)**
Handback Schedule (Deliverable)	-	70	-
Residual Life Methodology (Deliverable)	-	70	-
Enterprises' Review of Handback Schedule and Residual Life Methodology (Activity)	70	68	2
Initial Handback Inspections (Activity)	68	62	6
Preparation of Initial Handback Inspection Report and Asset Condition Report (Activity/Deliverable)	62	60	2
Initial Calculation of Handback Reserve Amount (Deliverable)	60	60	0
Enterprises' Review of Initial Handback Inspection Report, Asset Condition Report and Initial Calculation of Handback Reserve Amount (Activity)	60	58	2
Handback Work Period (Activity)	58	0	58
Second Handback Inspections (Activity)	42	39	3
Preparation of Second Handback Inspection Report and Asset Condition Report (Activity/Deliverable)	39	36	3
Second Calculation of Handback Reserve Amount (Deliverable)	36	36	0
Enterprises' Review of Second Handback Inspection Report, Asset Condition Report and Second Calculation of Handback Reserve Amount (Activity)	36	34	2
Establishment of Handback Reserve Account (Activity)	36	36	0
Establishment of Escrow Agreement (if required pursuant to Section 4.1.c) (Activity)	36	34	2
Initial Funding of Handback Reserve Account (Activity)	34	34	0
Handback Period (Activity)	34	0	34
Third Handback Inspections (Activity)	20	17	3
Preparation of Third Handback Inspection Report and Asset Condition Report (Activity/Deliverable)	17	14	3
Third Calculation of Handback Reserve Amount (Deliverable)	14	14	0
Enterprises' Review of Third Handback Inspection Report, Asset Condition Report and Third Calculation of Handback Reserve Amount (Activity)	14	12	2
Staff Training (Activity)	9	0	9
Final Handback Inspections (Activity)	3	1	2
Preparation of Final Handback Inspection Report and Asset Condition Report (Activity/Deliverable)	3	1	2

Issuance of Handback Certificate	<1	<1	0
Expiry Date		0	0

3.2. **Handback Schedule**

a. Developer shall prepare, and no later than 70 months prior to the Expiry Date shall submit to the Enterprises for Acceptance, a schedule that complies with the requirements set out in Section 3.2.b of this Schedule 12.

b. The Handback Schedule shall:

i. specify the dates of the activities to be undertaken by Developer for the remainder of the Term in accordance with the requirements of this Schedule 12; and

ii. state the date on which Developer shall provide the Enterprises an updated Maintenance Management Information System in accordance with Schedule 11 (*Operations and Maintenance Requirements*) that takes into account all Handback Inspections to be conducted pursuant to this Schedule 12.

3.3. **General Requirements for Residual Life Methodology**

a. Developer shall prepare, and no later than 70 months prior to the Expiry Date shall submit to the Enterprises for Acceptance, a report that complies with the requirements set out in Section 3.3.b of this Schedule 12.

b. The Residual Life Methodology Report shall:

i. include the evaluation and calculation criteria to be adopted for the calculation of the Residual Life at Handback of each Residual Element;

ii. comply with Good Industry Practice and be in accordance with the Enterprises' and/or CDOT's testing and forecasting methodologies in use in relation to similar Enterprise or CDOT owned or operated assets at the time of preparation of the report;

iii. include the scope of any Residual Life inspections and testing, together with a list of all inspection and testing organizations proposed by, and which shall be financially independent of, Developer; and

iv. address the specific requirements to be included in the Residual Life Methodology Report that are set out in the column headed "Residual Life Methodology (RLM) Requirement" in the table in set out in Appendix A (*Residual Life Requirements*) to this Schedule 12.

Developer shall ensure that all inspection and testing requirements conform to Good Industry Practice and reflect all technological advancements in the field of inspection, testing and Residual Life calculation.

c. In reviewing and commenting on the RLM, the Enterprises shall be allowed access to all of Developer's Project Records used in the preparation of the report.

d. Developer shall be required to obtain the Enterprises' Acceptance of the Residual Life Methodology Report, including the scope and schedule of inspections and tests proposed to be carried out, before commencing any Residual Life inspections and/or tests.

e. Developer shall ensure that the Enterprises are given the opportunity to witness any of the inspections and/or tests and shall provide the Enterprises with a minimum of 15 Working Days' notice prior to the performance of any inspections or tests.

f. Developer shall make full historic records of inspections, monitoring, testing, maintenance and Renewal Work that support the estimates of Residual Life for each Element available to the Enterprises.

3.4. **Qualification of Inspection Engineers and Organizations**

a. The Residual Life Methodology Report shall include the qualifications and experience of all independent engineers, testing facilities, specialists and organizations that shall undertake the Handback Inspections, all of which shall be submitted to the Enterprises for Acceptance in the Residual Life Methodology Report.

b. Developer shall cause:

i. all Handback Inspections to be conducted by a qualified independent consultant (financially independent of any Developer-Related Entity) appointed by Developer at its own cost and expense, who shall be an engineer registered in the State and shall owe a duty of care to both Developer and Enterprises jointly and whose identity and scope of work shall have been Accepted by the Enterprises (for the purposes of this Schedule 12, any such consultant (regardless of such consultant's scope of work), an "Accepted Independent Consultant"); and

ii. all Handback Inspection Reports and all Residual Life Methodology Reports to be prepared by an Accepted Independent Consultant.

3.5. **Asset Condition Report**

a. Developer shall prepare and shall submit (updated as appropriate) to the Enterprises for Acceptance, at the same time as it submits each Handback Inspection Report, a report that complies with the requirements set out in Section 3.5.b of this Schedule 12.

b. Each Asset Condition Report shall provide a record of the asset condition of all Elements, shall utilize the results of previous inspections and maintenance records held by the MMIS (supported by the results of the Handback Inspections) and, for each Element, shall set out:

i. a description and location of the Element;

ii. information that describes its current condition and rating according to CDOT's inspection manuals in use at the time of inspection, or other agreed inspection methodology;

iii. an assessment of (in the case of Residual Elements) its current Residual Life and (in the case of Renewal Elements) the period remaining of its Useful Life, in either case, based on the Handback Inspections, as well as the Renewal Work Plan inspection, testing and monitoring requirements set out in Schedule 11 (*Operations and Maintenance Requirements*); and

iv. photographs of the Element to support the assessment of the asset condition.

3.6. **General Requirements for Handback Inspections**

a. Developer shall carry out the inspection and testing detailed in the Handback Schedule and required by the terms of this Schedule 12 for assessing the condition of Elements against intended performance and predicting the time to next maintenance activity and calculated Residual Life.

b. Unless the method of inspection is previously mutually agreed with the Enterprises and then detailed in the Handback Inspection Report, Developer shall conduct all Handback Inspections in accordance with the inspection manuals, guidance, and standards issued by CDOT, and current at the time of inspection, that detail the means and methods for assessing the condition of national highway system assets including road pavement,

structures, cut slopes and embankments and other ancillary assets such as signs, fences, barriers and lighting stock.

3.7. **Initial Handback Inspections**

a. Developer shall procure that an Accepted Independent Consultant shall carry out the initial Handback Inspections to identify and establish the asset condition, Residual Life and period remaining of the Useful Life of all Elements and verify the extent of all Work required to ensure that the requirements set out in Section 1 of this Schedule 12 are satisfied as at the Expiry Date (the "Handback Work").

b. The inspection schedule shall be coordinated with the Enterprises and shall take account of the Enterprises' requirements for joint inspections, provided that, in any event, Developer shall provide the Enterprises a minimum of 15 Working Days' notice of any proposed inspection.

c. The initial Handback Inspections shall be carried out from 68 to 62 months prior to the Expiry Date.

d. Developer shall undertake appropriate testing to determine the condition of Elements, in accordance with the requirements set out in the column headed "Inspection Requirements" set out in Appendix A (*Residual Life Requirements*) to this Schedule 12. The required testing shall be identified based on the results of the inspections in order to permit an assessment of the performance and progressive deterioration of each Element over the Term. The testing shall be conducted under the control of an Accepted Independent Consultant.

3.8. **Initial Handback Inspection Report**

a. Following the initial Handback Inspection(s) and testing, Developer shall prepare, and no later than 60 months prior to the Expiry Date submit to the Enterprises for Acceptance, a report that complies with the requirements set out in Section 3.8.b of this Schedule 12.

b. The Initial Handback Inspection Report shall, at a minimum, include the following information:

i. initial Handback Inspection(s) results;

ii. results of the Asset Condition Report for all Elements;

iii. a list of each Residual Element that Developer considers:

A. did meet or exceed the applicable Target as set out in the Performance and Measurement Table in Appendix A-2 to Schedule 11 (*Operations and Maintenance Requirements*) at the time of the inspection;

B. would meet or exceed the applicable Target as set out in the Performance and Measurement Table in Appendix A-2 to Schedule 11 (*Operations and Maintenance Requirements*) as at the Expiry Date without the need for Handback Work; and

C. its Residual Life at Handback would meet or exceed its Residual Life Minimum Requirement without the need for Handback Work;

iv. a list of each Residual Element that Developer considers:

A. did not meet or exceed the applicable Target as set out in the Performance and Measurement Table in Appendix A-2 to Schedule 11 (*Operations and Maintenance Requirements*) at the time of the inspection and will require Handback Work prior to the Expiry Date to ensure that (i) it would meet or exceed such Target at the Expiry Date and (ii) its Residual Life at Handback would meet or exceed its Residual Life Minimum Requirement; and

B. did meet or exceed the applicable Target as set out in the Performance and Measurement Table in Appendix A-2 to Schedule 11 (*Operations and Maintenance Requirements*) at the time of the inspection, but will require Handback Work prior to the Expiry Date to ensure that (i) it would meet or exceed such Target at the Expiry Date and (ii) its Residual Life at Handback would meet or exceed its Residual Life Minimum Requirement; and

v. a schedule (the "Handback Work Schedule") providing details of all Handback Work required, the timing and implementation strategy for the Handback Work and an estimate of the Handback Reserve Amount.

c. In reviewing the report, the Enterprises shall be allowed access to all of Developer's Project Records used in the preparation of the report.

3.9. **Handback Work Obligation**

a. Developer shall carry out the Handback Work in accordance with the Handback Work Schedule set out in the Accepted Initial Handback Inspection Report and each subsequent Accepted Handback Inspection Report.

b. Handback Work identified as required in the Initial Handback Inspection Report and each subsequent Accepted Handback Inspection Report for any Residual Element to meet or exceed its Residual Life Minimum Requirement shall be completed no later than 18 months before the Expiry Date. All other Handback Work shall be completed before the Expiry Date.

c. During the Handback Work Period Developer shall ensure that all Elements comply with the applicable General Requirements and meet or exceed the applicable Targets specified for the relevant Element in Appendix A-2 to Schedule 11 (*Operations and Maintenance Requirements*).

d. During the Handback Work Period the Annual O&M Report shall detail the results of the Asset Condition Inspections, Specialist Inspections and Handback Work carried out during the previous year.

3.10. **Second and Third Handback Inspections**

a. The objective of the second and third Handback Inspection(s) shall be to update the Asset Condition Report of each Element and to record wherever actions have been taken such as repairs, Renewal Work and/or Handback Work to address the findings of the previous Handback Inspection Report.

b. The inspection schedule shall be coordinated with the Enterprises and shall take account of CDOT's requirements for joint inspections, provided that, in any event, Developer shall provide the Enterprises a minimum of 15 Working Days' notice of any proposed inspection.

c. Developer shall procure that an Accepted Independent Consultant shall carry out:

i. the second Handback Inspection(s) from 42 to 39 months prior to the Expiry Date; and

ii. the third Handback Inspection(s) from 20 to 17 months prior to the Expiry Date.

3.11. **Second and Third Handback Inspection Reports**

a. Following:

i. the second Handback Inspections, Developer shall prepare and, no later than 36 months prior to the Expiry Date; and

ii. the third Handback Inspections, Developer shall prepare and, no later than 14 months prior to the Expiry Date,

iii. in each case, submit to the Enterprises for Acceptance a report that complies with the requirements set out in Section 3.11.b of this Schedule 12.

b. The Second Handback Inspection Report and the Third Handback Inspection Report shall, at a minimum, include the following information:

i. results of the relevant Handback Inspection(s);

ii. list of repairs, Renewal Work and Handback Work undertaken subsequent to the previous Handback Inspection(s);

iii. revised Asset Condition Report for all Elements; and

iv. revised Handback Work Schedule.

c. In reviewing the reports, the Enterprises shall be allowed access to all of Developer's Project Records used in the preparation of the reports.

3.12. Final Handback Inspection Report

a. Three months prior to the Expiry Date, Developer shall procure that an Accepted Independent Consultant shall carry out the final Handback Inspections.

b. Developer shall prepare, and no later than one month prior to the Expiry Date submit to the Enterprises for Acceptance, a report that complies with the requirements set out in Section 3.12.c of this Schedule 12.

c. The Final Handback Inspection Report shall include the final Asset Condition Report of all Elements and a list of all such Elements and their Residual Life or Useful Life and shall demonstrate effective completion of all Handback Work identified in the Initial Handback Inspection Report, the Second Handback Inspection Report and the Third Handback Inspection Report.

d. Following the Enterprises' Acceptance of the Final Handback Inspection Report, they shall, in their discretion, issue a certificate to Developer certifying either:

i. that all Handback Requirements have been met; or

ii. that some, but not all, of the Handback Requirements have been met and any such certificate shall specify which Handback Requirements the Enterprises consider have not been met.

Any certificate issued pursuant to this Section 3.12.d is a "Handback Certificate".

3.13. Staff Training

No later than nine months prior to the Expiry Date, Developer shall make arrangements to provide training for the Enterprises' and CDOT's nominated employees, or any other persons designated by the Enterprises, pertaining to all the aspects of the operation and maintenance of the Project to facilitate a seamless handover.

4. Handback Reserve Account

4.1. Establishment and Security

a. No later than two months prior to the first day of the Handback Period, Developer shall establish an interest-bearing bank account (the "Handback Reserve Account"), with a financial institution to be selected by the Enterprises in their discretion, in the joint names of Developer and the Enterprises (or, at the discretion of the Enterprises, either of them). Promptly after establishing the Handback Reserve Account, Developer shall provide to the Enterprises all details regarding the Handback Reserve Account, including the name, address and contact information for the institution and the account number.

b. The Parties agree that (i) withdrawals from the Handback Reserve Account will only be permitted in accordance with this Section 4 and (ii) any withdrawal from the Handback

Reserve Account will require the prior written approval of all named account holders (which approval each account holder shall be required to provide if the proposed withdrawal is in accordance with this Section 4), other than in circumstances where Section 4.4.e of this Schedule 12 applies, in which event any withdrawal in accordance with such Section shall not require the prior written approval of Developer.

c. At the discretion of the Enterprises, the Handback Reserve Account, and withdrawals therefrom, shall be controlled by a third party escrow agent pursuant to the terms of an escrow agreement to be entered into by such agent and the Parties prior to the date that the initial funding of the Handback Reserve Account is required pursuant to Section 4.2.b.i of this Schedule 12. If the Enterprises exercise their discretion pursuant to this Section 4.1.c, the identity of such agent, and the terms of such agreement, shall be agreed between the Parties, acting reasonably.

d. Developer shall not be permitted to grant any Encumbrance in favor of any third party (including, for certainty, its Lenders) in relation to the Handback Reserve Account or any amounts standing to the credit of it.

4.2. **Reserve Funding**

a. No later than the date which is:

i. two months prior to the commencement of the Handback Work Period;

ii. two months prior to the commencement of the Handback Period; and

iii. 14 months prior to the Expiry Date,

Developer shall deliver to the Enterprises a report setting out its calculations of the Handback Reserve Amount in accordance with Section 4.3 of this Schedule 12, together with the report of an Accepted Independent Consultant, either verifying that the Developer's calculations of the Handback Reserve Amount are consistent with the then most recent Handback Work Schedule or stating the consultant's determination of the Handback Reserve Amount. Such reports shall be addressed to the Enterprises and (in the case of each report of an Accepted Independent Consultant) shall state explicitly that the Enterprises may rely on the report. Within 45 Calendar Days of any such report being delivered to the Enterprises, the Parties shall seek to agree (acting reasonably) upon the Handback Reserve Amount and, in the absence of agreement within such period, the Handback Reserve Amount shall be the amount equal to the amount specified in the Accepted Independent Consultant's report.

b. Subject to Section 4.5 of this Schedule 12, no later than five Working Days:

i. prior to the commencement of the Handback Period, Developer shall be required to fund the Handback Reserve Account in the amount of the Handback Reserve Amount determined in accordance with Section 4.2.a of this Schedule 12;

ii. after determination of the Handback Reserve Amount in accordance with Section 4.2.a of this Schedule 12 following submission of a report in accordance with Section 4.2.a.iii of this Schedule 12, Developer shall be required to ensure that the Handback Reserve Account is funded in an amount at least equal to the Handback Reserve Amount, provided that, to the extent that the amount standing to the credit thereof at such time exceeds the Handback Reserve Amount, the Developer shall be entitled to have such excess amount withdrawn and paid to it.

c. Unless Developer has provided and maintains a Handback Letter of Credit that complies with the requirements of Section 4.5 of this Schedule 12, to the extent that at any time after the commencement of the Handback Period the balance standing to the credit of the Handback Reserve Account is not at least equal to the Handback Reserve Amount, the Enterprises shall, until such time as the balance standing to the credit of the Handback Reserve Account is equal to the Handback Reserve Amount, make deductions from subsequent Performance Payments, and pay such amounts into the Handback Reserve

Account, provided that, at any time during the Handback Reserve Standstill Period, the Enterprises shall not make such deductions to the extent that such deductions would:

i. in aggregate with all other deductions made with respect to any Performance Payment, result in:

A. a payment default;

B. the balance of any debt payment account being less than the required balance under the Financing Agreements;

C. a failure to fund any required reserve under the Financing Agreements; or

D. a drawing on any debt service reserve under the Financing Agreements; or

ii. be made at such time that:

A. a payment default has occurred and is continuing; or

B. the balance of any debt payment account is less than the required balance under the Financing Agreements,

in each case as determined based on a notice from Developer countersigned by the Collateral Agent.

4.3. **Calculation of Handback Reserve Amount**

The following methodology shall be used for calculating the Handback Reserve Amount.

a. The "Handback Renewal Elements Amount" means the aggregate amount, which shall be calculated by an Accepted Independent Consultant, of the estimated cost (in real dollars) to renew or replace each Renewal Element at the end of its Useful Life multiplied by a fraction (the "Deterioration Fraction", the numerator of which is its Age and the denominator of which is its Useful Life). In such calculation:

i. the Handback Renewal Elements Amount shall not be less than zero;

ii. the value of the Deterioration Fraction shall not be greater than 1.0; and

iii. where a Renewal Element has not been renewed or replaced during the Term, the value of the Deterioration Fraction for such Element shall be 1.0.

b. The "Handback Residual Elements Amount" means the aggregate amount, which shall be calculated by an Accepted Independent Consultant, of the estimated cost (in real dollars) to improve, repair, renew or replace each Residual Element to ensure that its measured Residual Life at Handback will meet or exceed its Residual Life Minimum Requirement.

c. Where the Age, Useful Life or Residual Life of any Element varies across the Project, the calculations of the Handback Renewal Elements Amount and the Handback Residual Elements Amount shall take into account such variability through multiple calculation line items for each relevant Element, each line item calculating the Handback Reserve Amount for component parts of the Element having similar Age, Useful Life or Residual Life as appropriate. The calculations of the Handback Renewal Elements Amount and the Handback Residual Elements Amount shall be made using the values of Age, Useful Life, Residual Life and estimated costs applicable as of the date of each calculation.

d. For purposes of calculating the Handback Reserve Amount, the estimated costs of performing the Handback Work shall be equal to the greater of (i) the cost to Developer of self-performing the Handback Work and (ii) the cost to Developer of procuring the performance of the Handback Work by one or more third parties on an arms-length and commercially reasonable basis, in the case of (i) and (ii), inclusive of all design,

engineering, construction, QA/QC, overhead, profit, insurance, bonding, escalation and other costs to perform such Handback Work in full.

4.4. **Handback Reserve Account Use**

a. Subject to Section 4.4.b of this Schedule 12, Developer shall not be entitled to withdraw funds from the Handback Reserve Account to pay for the cost of performing any Handback Work.

b. If, at any time during the Handback Reserve Standstill Period, Developer notifies the Enterprises that a withdrawal of funds from the Handback Reserve Account to pay for the cost of any Handback Work that has been performed is necessary to avoid:

i. a payment default;

ii. the balance of any debt payment account being less than the required balance under the Financing Agreements;

iii. a failure to fund any required reserve under the Financing Agreements; or

iv. a drawing on any debt service reserve under the Financing Agreements,

and such notice is countersigned by the Collateral Agent, any amounts standing to the credit of the Handback Reserve Account may at Developer's request be withdrawn to reimburse Developer for reasonable and documented third-party costs and expenses previously incurred by Developer to effect Handback Work to the extent, but only to the extent, necessary to avoid such default, deficiency or drawing.

c. The Handback Reserve Account shall remain in place and (subject to Sections 4.2.c, 4.4.b, and 4.5 of this Schedule 12) be fully funded at all times in an amount at least equal to the Handback Reserve Amount until the issuance of a Handback Certificate by the Enterprises or, if earlier, the Termination Date.

d. Promptly following the issuance of a Handback Certificate by the Enterprises, any amounts standing to the credit of the Handback Reserve Account shall be withdrawn as follows:

i. if the Handback Certificate certifies that any Handback Requirements have not been met, in the following order of priority:

A. first, an amount equal to the portion of the Handback Reserve Amount equal to the cost of performing the Handback Work not performed by Developer shall be paid to the Enterprises; and

B. second, the remaining balance shall be paid to the Developer; or

ii. if the Handback Certificate certifies that all Handback Requirements have been met, the full balance standing to the credit of the Handback Reserve Account shall be paid to the Developer.

e. If the Termination Date occurs prior to the issuance of a Handback Certificate, the full balance standing to the credit of the Handback Reserve Account as at the Termination Date shall be paid to the Enterprises.

f. Any interest that accrues on amounts standing to the credit of the Handback Reserve Account shall only be withdrawn at the times other amounts are being withdrawn therefrom in accordance with, and shall be withdrawn pursuant to, Sections 4.2.b.ii and 4.4.d of this Schedule 12.

4.5. **Handback Letter of Credit**

a. Instead of funding the Handback Reserve Account, Developer may, at its discretion, deliver to the Enterprises one or more letters of credit (collectively, the "Handback Letter of Credit") from an Eligible Financial Institution, each in a form Acceptable to the

Enterprises and on the basis that the Enterprises shall be the sole beneficiaries, with aggregate value equal to the Handback Reserve Amount (provided that, for certainty, notwithstanding such delivery by Developer, it shall in any event be required to establish (but not fund) the Handback Reserve Account in accordance with the requirements of Section 4.1 of this Schedule 12).

b. The Enterprises shall have the right to draw on the Handback Letter of Credit:

i. in circumstances where, had Developer not elected to deliver a Handback Letter of Credit pursuant to this Section 4.5, the Enterprises would have been entitled to payment of a portion of the amounts standing to the credit of the Handback Reserve Account pursuant to Sections 4.4.d or 4.4.e of this Schedule 12, up to an amount equal to such portion;

ii. if the issuer of the Handback Letter of Credit ceases to be an Eligible Financial Institution, up to the full amount of the Handback Letter of Credit, provided that, following such a draw, the Enterprises shall pay such amount into the Handback Reserve Account and the provisions of Sections 4.1, 4.2 and 4.4 of this Schedule 12 shall apply thereafter to the operation of the Handback Reserve Account; or

iii. if the Termination Date occurs prior to the issuance of a Handback Certificate, up to the full amount of the Handback Letter of Credit.

5. Deliverables

Deliverables shall be submitted for Acceptance in accordance with the specified time frames in both electronic format and hardcopy format. Acceptable electronic formats include Microsoft Word, Microsoft Excel, or Adobe Acrobat (PDF) files, unless otherwise indicated.

Deliverable	Information, Acceptance or Approval	Schedule
Handback Schedule	Acceptance	70 months before the Expiry Date
Residual Life Methodology Report	Acceptance	70 months before the Expiry Date
Asset Condition Report	Acceptance	Submit with all Handback Inspection Reports
Handback Work Schedule	Acceptance	Submit with all Handback Inspection Reports
Initial Handback Inspection Report	Acceptance	60 months before the Expiry Date
Initial Calculation of Handback Reserve Amount	Acceptance	60 months before the Expiry Date
Second Handback Inspection Report	Acceptance	36 months before the Expiry Date
Second Calculation of Handback Reserve Amount	Acceptance	36 months before the Expiry Date
Third Handback Inspection Report	Acceptance	14 months before the Expiry Date
Third Calculation of Handback Reserve Amount	Acceptance	14 months before the Expiry Date
Final Handback Inspection Report	Acceptance	After final Handback Inspections

Appendix A
Residual Life Requirements

Element	Residual Life at Handback (yrs)	Inspection Requirements	Residual Life Methodology (RLM) Requirement
Road Pavement			
Traveled way – structural capacity	10	Pavement inspections shall be undertaken by an Accepted Independent Consultant. Inspections shall provide a continuous or near-continuous record of Residual Life in each lane. Where the inspection method does not provide a continuous record of Residual Life, the number of valid measurements in each measurement section shall be sufficient to give a statistically valid result. Inspections shall be repeatable to an agreed level of accuracy and inspection contracts shall include an agreed proportion of inspections to verify accuracy. Inspections shall include automated condition distress survey, ride quality, skid resistance, rutting and faulting and measurement of structural capacity of the pavement.	RLM shall: • Be capable of calculation of Residual Life for any 0.1 mile section of the road pavement. • Take account of the thickness and stiffness of the pavement layers, the pavement loading history in equivalent standard axles as calculated from the traffic volume reports and the forecast traffic volumes, measured in equivalent standard axles, for the following 15 years. At the Expiry Date, the structural capacity of each lane of the mainline roadway shall be such that a rehabilitation design for 10 years of traffic loading starting as of the Expiry Date will require no more than a 2-inch asphalt concrete overlay or equivalent treatment for the pavement type. The calculation method may assume that the 2 inch overlay is applied at any time over the ten years following the Expiry Date. The 10 year traffic loading will be determined based on the average annual traffic measured over the four years prior to the date upon which the calculation is undertaken and shall not include any predicted traffic escalation. Pavement strength testing and subsequent analysis to determine the structural capacity and the rehabilitation needed to meet the requirement above shall be completed by an Accepted Independent Consultant. Developer shall provide all traffic accommodation to allow pavement strength testing or other testing (either destructive or non-destructive), as required.

Appendix A

Residual Life Requirements

Element	Residual Life at Handback (yrs)	Inspection Requirements	Residual Life Methodology (RLM) Requirement
Structures			
Reinforced concrete	40	Inspections of structures shall be undertaken by Accepted independent testing organizations. Inspections shall follow the latest inspection guidelines (as they apply at the relevant date that the testing is undertaken) recognized by the Enterprises. A close examination shall be made of all parts of each structure. Non-destructive tests shall be undertaken appropriate to the type of structure. These shall include the measurement of structural deflection under calibrated load, the measurement of chloride and carbonation profiles from surface to reinforcement and/or tendon level, half-cell potential and the in-situ strength testing of concrete elements. Testing of steel structures shall include the depth of corrosion and/or the measurement of remaining structural thickness for hidden and exposed parts. All lengths of weld shall be tested for cracking at key areas of structural steelwork.	RLM shall: • Draw on historical asset maintenance records, inspection and test histories for each structure. Take account of the Enterprises', CDOT's and FHWA records of other structures on the network with similar characteristics. • Include an assessment of load carrying capacity based on the original structural design calculations, the as built drawings, loading history and results of load deflection tests where appropriate. • Take account of any trends in asset deterioration to determine the rate of deterioration and to predict the future condition of individual Elements and the entire structure. • Take account of industry guidance relating to residual life estimation. The measured performance shall be compared with expected performance and trends in asset deterioration and maintenance to predict the future condition and maintenance requirements of main structural Elements.
Pre-stressed concrete	40		
Structural steelwork	40		
Weathering steel	40		
Corrugated steel	40		

Appendix A

Residual Life Requirements

Element	Residual Life at Handback (yrs)	Inspection Requirements	Residual Life Methodology (RLM) Requirement
Bridge Deck (Structural)	40	Inspections shall be in accordance with the Durability Plan schedule. Inspections shall, at a minimum, identify and measure de-lamination in bridge decks by chain dragging or hammer sounding, the measurement of chloride and carbonation profiles from surface to reinforcement and/or tendon level, half-cell potential and the in-situ strength testing of concrete elements.	As per the above requirements for structures.
Railing	25	Inspections of structures shall be undertaken by Accepted independent engineers, test facilities and specialists. For visual inspections and measurement, competence shall be based on experience and training. For Specialist Inspections, competence shall be based on the possession of valid national or international certification by a recognized certification authority. Inspections shall follow the latest inspection guidelines (at the time of inspection) issued by CDOT. A close visual inspection shall be made of all parts of each structure including items such as hidden or limited access components such as cables, bearings and expansion joints.	RLM shall: • Draw on historical asset maintenance records, inspection and test histories for each structure. • Take account of the Enterprises', CDOT's and FHWA records of other structures on the network with similar characteristics.
Bearings	25		
Overhead sign supports (structural Elements)	15		
Retaining walls (Including MSE Walls)	40		
Waterproofing Membrane within the Cover Garden Roof Assembly	40		

Appendix A

Residual Life Requirements

Element	Residual Life at Handback (yrs)	Inspection Requirements	Residual Life Methodology (RLM) Requirement
Drainage			
Underground storm sewer systems (Including pipes, manholes, chambers.)	40	Inspection of storm sewer systems shall include closed circuit TV inspection of all buried pipe work. Groundwater level monitoring at locations defined in the Residual Life Methodology Report shall be required to provide assurance of a 10 year Residual Life for groundwater interceptor drains. Inspection of stormwater management systems shall include all components such as ditches, stormwater basins and filters. Inspections of culverts shall include measurement of deformation. Confirm that all Elements and assemblies for inlets, outfalls, water quality structures and detention ponds function as designed.	RLM shall: • Draw on historical asset maintenance records, inspection and test histories for each Element of the drainage system. • Include a methodology to determine the Residual Life of filter drains designed to intercept groundwater. • Draw on design and Permit requirements.
Culverts/ headwalls	40		
Reinforced ditches (Concrete lined, rock channel, tied concrete block, energy dissipaters.)	10		
Underdrains, filter drains	10		
End Treatments (inlet protection, aprons)	25		
Water Quality features	10		

Appendix A

Residual Life Requirements

Element	Residual Life at Handback (yrs)	Inspection Requirements	Residual Life Methodology (RLM) Requirement
Earthworks			
Earthwork slopes (Including reinforced soil slopes)	30	For embankment and cut slopes a risk based inspection procedure shall be adopted following Good Industry Practice. Deformation monitoring will be required to provide assurance through the RLM of a 30-year Residual Life. Inspections of all ancillary items shall be undertaken by personnel having adequate training on modes of failure, risk assessment and observational skills.	RLM for earthwork slopes shall draw on historical inspection and asset maintenance records and the vulnerability of the slope to failure.
Ancillaries			
Concrete barrier (median)	15	Inspections of all ancillary items shall be undertaken by personnel having adequate training on modes of failure, risk assessment and observational skills where applicable elements will be rated to ensure adequate performance and load resistance. Unless otherwise agreed inspections to be carried out in accordance with guidance, manuals and standards issued by CDOT current at the time of inspection.	RLM shall draw on historical inspection, maintenance and rehabilitation records for system components, and life cycle and durability analyses.
Fences	10		
Light Poles	10		
Curbs and gutters	10		
Manhole covers, gratings, frames and boxes	20		

Appendix A
Residual Life Requirements

Element	Residual Life at Handback (yrs)	Inspection Requirements	Residual Life Methodology (RLM) Requirement
Mechanical and Electrical Systems			
Cabling, joints, switch gear, etc.	20	Inspection scope and depth shall be determined by the inspecting organization but as a minimum shall be based upon relevant State or Federal codified requirements, applicable NFPA Standards, and by the design and system manufacturer's/fabricators inspection requirements.	RLM shall draw on historical inspection, maintenance and rehabilitation records for system components, and life cycle and durability analyses.
Cover Plumbing Systems			
Standpipe and Sprinkler/Deluge Piping and nozzles	20	Inspections shall be based upon Good Industry Practice, manufacturers' inspection requirements and applicable FHWA requirements and NFPA Standards. Inspection of electrical systems shall be undertaken by qualified individuals (NETA or equivalent for electrical, NICET for Fire Alarm, other) and performed in accordance with NFPA 70B, as a minimum.	RLM shall draw on historical inspection, maintenance and rehabilitation records for system components, and life cycle and durability analyses and historical fault logs from the SCADA system
Roadway Piping and Drains	20		
ITS/Tolling Equipment			
ITS and Tolling Civil Infrastructure (conduits, conductors, cables and pull boxes, cabinets and foundations)	20	Inspections shall be based upon Good Industry Practice, manufacturers' inspection requirements and Applicable Standards.	RLM shall be based on the manufacturer's or supplier's recommended component life together with records of performance from Developer including historical inspection, maintenance and rehabilitation records for system components, and life cycle and durability analyses

Appendix B

Useful Life Baseline Requirements

Element	Useful Life (yrs)
Road Pavement	
Traveled way – surfacing including ramps	10
Structures	
Corrosion protection for structural steelwork	30
Bridge wearing surface	20
Deck joints	20
Cover MEP Systems	10
Roadside Ancillaries	
Metal beam guard rail	20
Impact attenuators	20
Overhead sign panels	10
Lighting luminaries and regulators	8
Roadside traffic sign panels	10
Pavement markings	2
Delineators	4

Schedule 13
Required Insurances

1. CONSTRUCTION PERIOD INSURANCES

From the Financial Close Date until (unless specified otherwise in this Section 1 of this Schedule 13) the Substantial Completion Date, Developer will obtain and maintain, or cause to be obtained and maintained, the Insurance Policies with respect to the Work (including O&M Work During Construction) and the Project described in this Section 1 of this Schedule 13.

1.1. "All Risk" Builders' Risk

Builder's Risk insurance written on an "all risks" basis, completed value form, on a non-reporting basis, insuring against "all risks", including the following perils: loss or damage by fire, collapse, lightning, windstorm, tornado, flood, earthquake, hail, explosion, riot, vandalism and malicious mischief, civil commotion, aircraft, vehicle impact, terrorism (both domestic and foreign acts of terrorism), smoke and such other risks as are usual to a similarly situated project, such insurance to:

a. be in an amount not less than:

   i. the lesser of:

      A. (or such other amount proposed by Developer and consented to by the Enterprises (such consent not to be unreasonably withheld)), which amount in either case reflects the full replacement cost of the Work and the Project, including on and off-site fabrication, installation, storage and staging areas; and

      B. the Probable Maximum Loss for the Work and the Project (and, with respect to any sublimits, subject to Sections 1.1.c, 1.1.d, 1.1.e, 1.1.g.ii and 1.1.g.iv of this Schedule 13, the Probable Maximum Loss in respect of the relevant peril), including on and off-site fabrication, installation, storage and staging areas; *plus*

   ii. until such date as the demolition of the existing viaduct is completed:

      A. ; *plus*

      B. in extra expense insurance, which extra expense insurance may be combined with that specified in Section 1.1.g.ii of this Schedule 13, subject to a combined limit of with respect to any one loss, to cover, among other things, the additional expenses incurred for traffic rerouting following an insured loss to the viaduct;

b. provide for either a DE 5 or LEG 3 exclusion pertaining to the cost of making good any faulty work, faulty materials, or any design error or omission;

c. provide coverage for demolition/debris removal costs and increased cost of construction, with a minimum sublimit of

d. provide "Ordinance or Law Coverage", with a minimum sublimit of ;

e. if such insurance places a sublimit on flood coverage, include a sublimit which shall be no less than the greater of:

   i. ; and

   ii. the Probable Maximum Loss in respect of such peril;

f. include coverage for delay in start-up on a gross income basis for the greater of:

   i. 12 months of delay; and

   ii. the Probable Maximum Delay;

g. include coverage for the following, with the limits specified below:

i. property in transit (in-land only) and unnamed locations;

ii. extra/expediting expenses (with a minimum sublimit of);

iii. off premises services interruption to a minimum of FLEXA perils cover;

iv. professional fees (with a minimum sublimit of);

v. valuable papers;

vi. hot and cold testing and commissioning (with a minimum limit of 120 Calendar Days);

vii. prevention of access (with a minimum limit of eight weeks); and

viii. ingress/egress (with a minimum limit of eight weeks); and

h. provide for interim payments in the event of any loss.

1.2. Commercial General Liability

Commercial general liability insurance (together with any excess or umbrella liability) against claims for personal injury (including bodily injury and death) and property damage or loss (including liabilities as a result of repairs and alterations) however arising occurring with respect to the Work or the Project, including on and off-site fabrication, installation, storage and staging areas, such insurance to:

a. be on an occurrence form (as that term is used in the insurance industry) with a combined single limit of not less than per occurrence and in the aggregate which may be provided in a layered placement, with the layers excess of the primary general liability to provide excess automobile liability and employers' liability;

b. be subject to an ISO CG 22 80 endorsement and no other professional services exclusions; and

c. cover at least the following hazards:

i. premises and operations liability;

ii. completed operations for a period of not less than eight years after the Substantial Completion Date or, if later, the expiration of any applicable statutes of limitation or repose;

iii. independent contractors;

iv. blanket contractual liability for all contracts;

v. sudden and accidental pollution to a minimum of 240 hours detection and a further 240 hours reporting to insurers;

vi. broad form property damage;

vii. contingent employers' liability;

viii. non-owned automobile liability (provided that the limits, scope and amount of coverage are not less than would be provided by the Insurance Policy required pursuant to this Section 1.2, at the option of the Developer such coverage may instead be provided under the Insurance Policy required pursuant to Section 1.6 of this Schedule 13);

ix. cross liability and severability of interests; and

x. employees as additional insureds.

1.3. Workers' Compensation and Employers' Liability

Workers' compensation insurance, as required by the statutory limits of the State, and employers' liability with a limit of not less than and excess liability coverage.

1.4. Professional Liability

a. From the Financial Close Date until the eighth anniversary of the Substantial Completion Date (or for a total period of ten (10) years from the Financial Close Date if the insurance is provided by a policy specific to this Project), professional liability insurance, which may be written on a claims made form with limits of liability not less than per claim and annual aggregate (or, if the insurance is provided by a policy specific to this Project, policy aggregate) for:

   i. each of the Principal Subcontractors (other than the O&M Contractor or any other Principal Subcontractor only performing O&M Work);

   ii. the Lead Engineer (as defined in the ITP and, as of the Agreement Date, as identified in the Preferred Proposer's Proposal); and

   iii. each other Subcontractor (if any) that both:

      A. is responsible primarily for engineering and design of any of those structural Elements of the Work that Developer is required to design and construct in accordance with the requirements of Section 13 of Schedule 10 (*Design and Construction Requirements*); and

      B. in the performance of its work as a Subcontractor acts, or employs any individual who acts, as a licensed professional engineer in responsible charge of structural design work.

b. Developer will ensure that all other professionals performing design, engineering, quality management, inspection, surveying and related professional services in respect of the Work and the Project carry or are covered by professional liability insurance for limits that are in accordance with Good Industry Practice.

1.5. Contractors' Pollution Liability and Pollution Legal Liability (Combined Form)

Contractors' pollution liability and pollution legal liability insurance for the Work and the Project, which may be written on a claims made form, such insurance to:

a. be with limits of not less than per occurrence (or such similar term as defined in the policy or policies) and aggregate; and

b. include coverage for:

   i. environmental impairment liability;

   ii. third party bodily injury;

   iii. property damage liability (including remediation and clean-up costs);

   iv. disposal site and transportation extensions; and

   v. underground storage tanks; and

c. provide for an extended reporting period until the earlier of: (i) the eighth anniversary of the Substantial Completion Date; and (ii) the tenth anniversary of the Agreement Date,

provided that, should such contractors' pollution liability and pollution legal liability insurance be provided in separate policies, the limits of per occurrence (or such similar term as defined in the policy or policies) and aggregate will apply to each policy.

1.6. Automobile Liability

Automobile liability insurance on any owned, non-owned, and hired automobile used in connection with the Work and the Project with a limit of not less than per occurrence.

1.7. Aircraft Liability

If and when aircraft are used in the performance of the Work and the Project, aircraft liability insurance (including owned and non-owned aircraft) which coverage will be with limits of not less than per occurrence and in the aggregate. Where the only aircraft used in the performance of the Work and the Project are unmanned aerial vehicle(s), at the option of the Developer, such coverage may instead be provided under the Insurance Policy required pursuant to Section 1.2 of this Schedule 13.

1.8. Railroad Liability and Railroad Protective Liability

If such coverage is not already provided under the commercial general liability insurance required pursuant to Section 1.2 of this Schedule 13, railroad liability and railroad protective liability insurance which coverage shall be with limits of not less than per occurrence and in the aggregate or, if higher, such other limits as required by UPRR, BNSF or DRIR in connection with the Work and the Project. This insurance shall be in effect only at such times as are required by the relevant Railroad.

1.9. Marine Cargo

If and when any property, materials or equipment intended to be used in connection with the Work and the Project are to be shipped by sea, marine cargo insurance which coverage shall provide coverage in an amount of not less than full replacement value per occurrence.

1.10. Contractors' Equipment

Contractors' equipment insurance covering any piece of equipment with a replacement cost in excess of , which coverage shall provide coverage in an amount of not less than full replacement value per occurrence.

1.11. Insureds

All Insurance Policies required pursuant to this Section 1 of this Schedule 13:

a. other than the policies required pursuant to Sections 1.4 and 1.8 of this Schedule 13, must include Developer and the Construction Contractor as named insureds; and

b. other than the policies required pursuant to Sections 1.3, 1.4, 1.8, 1.9 and 1.10 of this Schedule 13, must include the Specified Additional Insureds as additional insureds.

2. OPERATING PERIOD INSURANCES

From the Substantial Completion Date for the duration of the Term, Developer will obtain and maintain, or cause to be obtained and maintained, the Insurance Policies with respect to the Work and the Project described in this Section 2 of this Schedule 13.

2.1. "All Risks" Property

"All Risks" property insurance with no co-insurance including the following perils: loss or damage by fire, collapse, lightning, windstorm, tornado, flood, earthquake, hail, explosion, riot, vandalism and malicious mischief, civil commotion, aircraft, vehicle impact, terrorism (both domestic and foreign acts of terrorism), smoke and such other risks as are usual to a similarly situated project, such insurance to:

a. be in an amount equal to the lesser of:

i. the full replacement cost of the Work and the Project, including on and off-site fabrication, installation, storage and staging areas; and

ii. the Probable Maximum Loss for the Work and the Project (and, with respect to any sublimits, subject to Sections 2.2.b, 2.1.c.iv and 2.1.c.vi of this Schedule 13, the Probable Maximum Loss in respect of the relevant peril), including on and off-site fabrication, installation, storage and staging areas;

b. if such insurance places a sublimit on flood coverage, include a sublimit which shall be no less than the greater of:

i. and

ii. the Probable Maximum Loss in respect of such peril;

c. include coverage for the following, within the limits specified below:

i. business interruption on a gross income basis for the greater of:

A. 12 months of delay; and

B. the Probable Maximum Delay;

ii. boiler and machinery perils including machinery breakdown;

iii. property in transit (in-land only) and unnamed locations;

iv. extra/expediting expenses (with a minimum sublimit of ;

v. off premises services interruption;

vi. professional fees (with a minimum sublimit of);

vii. valuable papers;

viii. prevention of access (with a minimum limit of eight weeks);

ix. ingress /egress (with a minimum limit of eight weeks); and

d. provide for interim payments in the event of any loss.

2.2. Commercial General Liability

Commercial general liability insurance (together with any excess or umbrella liability) against claims for personal injury (including bodily injury and death) and property damage or loss (including liabilities as a result of repairs and alterations) however arising occurring with respect to the Work or the Project, including on and off-site fabrication, installation, storage and staging areas, such insurance to:

a. be on an occurrence form (as that term is used in the insurance industry) with a combined single limit of not less than per occurrence and in the aggregate, which may be provided in a layered placement, with the layers excess of the primary general liability to provide excess automobile liability and employers' liability; and

b. include coverage for:

i. premises and operations liability;

ii. products and completed operation liability;

iii. independent contractors;

iv. blanket contractual liability for all contracts;

v. sudden and accidental pollution;

vi. broad form property damage;

vii. contingent employers' liability;

viii. non-owned automobile liability (provided that the limits, scope and amount of coverage are not less than would be provided by the Insurance Policy required

pursuant to this Section 2.2, at the option of the Developer such coverage may instead be provided under the Insurance Policy required pursuant to Section 2.5 of this Schedule 13);

ix. cross liability and severability of interests clause; and

x. employees as additional insureds.

2.3. Workers' Compensation and Employers' Liability Insurance

Workers' compensation insurance, as required by the statutory limits of the State, and employers' liability with a limit of no less than and excess liability coverage.

2.4. Pollution Liability

Pollution and environmental impairment liability insurance for the Work and Project, which may be written on a claims made form, such insurance to:

a. be with limits of not less than per occurrence and annual aggregate; and

b. include coverage for:

i. environmental impairment liability;

ii. third party bodily injury;

iii. property damage liability (including remediation and clean-up costs);

iv. disposal site and transportation extensions; and

v. underground storage tanks.

2.5. Automobile Liability

Automobile liability insurance on any owned, non-owned and hired automobile used in connection with the Work and the Project with a limit of not less than per occurrence.

2.6. Railroad Liability and Railroad Protective Liability

If such coverage is not already provided under the commercial general liability insurance required pursuant to Section 2.1 of this Schedule 13, railroad liability and railroad protective liability insurance which coverage shall be with limits of not less than per occurrence and in the aggregate or, if higher, such other limits as required by UPRR, BNSF or DRIR in connection with the Work and the Project.

2.7. Insureds

All Insurance Policies required pursuant to this Section 2 of this Schedule 13:

a. other than the policies required pursuant to Section 2.6 of this Schedule 13, must include Developer and the O&M Contractor as named insureds; and

b. other than the policies required pursuant to Sections 2.3 and 2.6 of this Schedule 13, must include the Specified Additional Insureds as additional insureds.

2.8. Indexation

a. All Dollar figures in the Insurance Policy requirements set out in Section 2.1 of this Schedule 13 shall be indexed annually pursuant to Section 2.3 of the Project Agreement.

b. All Dollar limits of liability in the Insurance Policy requirements set out in Sections 2.2, 2.4 and 2.5 of this Schedule 13 shall be indexed:

i. on the fifth anniversary of the Substantial Completion Date with respect to the preceding five year period; and

ii. on each fifth anniversary of the initial indexation pursuant to Section 2.8.b.i of this Schedule 13 with respect to the preceding five year period,

in either case, pursuant to Section 2.3 of the Project Agreement.

c. After indexation has been applied from time to time, Developer's obligation shall be to take out and maintain, or to cause the obtaining and maintenance of, insurance pursuant to Section 25 of the Project Agreement and this Schedule 13 where the limits are as close to and in excess of the indexed values as is reasonably obtainable in the insurance market, provided that such obligation shall only apply to newly placed or renewed Insurance Policies and not to the Insurance Policies in effect at such time as the indexation applies.

3. GENERAL REQUIREMENTS

3.1. Probable Maximum Loss Study

3.1.1. Whenever this Schedule 13 references:

a. "Accepted PML Study", such term means the PML Study (and any update thereto) Accepted by the Enterprises;

b. "PML Study", such term has the meaning given to it in Section 3.1.2 of this Schedule 13;

c. "Probable Maximum Delay", such term means each probable maximum delay period limit determined from time to time pursuant to an Accepted PML Study; and

d. "Probable Maximum Loss", such term means each probable maximum loss amount limit (or sublimit) determined from time to time pursuant to an Accepted PML Study.

3.1.2. If, at any time, Developer elects to place the insurance required pursuant to Section 1.1 or 2.1 of this Schedule 13 on a Probable Maximum Loss and Probable Maximum Delay basis, Developer shall submit to the Enterprises, for Acceptance, a Probable Maximum Loss and Probable Maximum Delay study (a "PML Study", which term, if such a study has previously been submitted by Developer pursuant to this Section, shall include any updates thereto submitted by Developer pursuant to this Section) performed for the Developer by its Insurance Broker prior to, as the case may be:

a. the placement of coverage required pursuant to Section 1.1 of this Schedule 13;

b. the first placement on such basis of any coverage required pursuant to Section 2.1 of this Schedule 13; and

c. following submission of a PML Study pursuant to Section 3.1.2.b of this Schedule 13, every sixth anniversary of the placement of coverage referenced in such Section.

3.2. Deductibles

Each Insurance Policy may include deductibles and, for certainty, shall not include any self-insured retentions except that a self-insured retention may be utilized on the Insurance Policies required pursuant to Sections 1.4, 1.5 and 2.4 of this Schedule 13.

3.3. Placement on Occurrence Basis

Except for the Insurance Polices required pursuant to Sections 1.4, 1.5 and 2.4 of this Schedule 13, all liability insurance Policies shall be placed on an occurrence and not a claims made basis.

3.4. Reinstatement Work and Loss Payee Provisions

Any loss payee provision in any Insurance Policy shall be consistent and not conflict with the requirements of Section 25.5 of the Project Agreement.

3.5. Maintenance Yard

All references in this Schedule 13 to "the Work and the Project" (or statements to similar effect) shall be interpreted to include, with effect from the Snow and Ice Control Commencement Date, the Maintenance Yard (including activities performed thereat).

Schedule 14
Strategic Communications

1. GENERAL

1.1. General Requirements

1.1.1. Providing timely, relevant and context sensitive information is a critical component of the Project. The Developer and the Department shall work collaboratively to provide a robust and coordinated communications approach to achieve the overall Strategic Communication goals. The Developer shall be responsible for development and implementation of a communication strategy in collaboration with the Department and in accordance with the requirements of this Schedule. The Developer shall document these communication strategies in an overall Strategic Communications Plan, which shall comprise the individual plans required within this Schedule and which is consistent with and expands upon the draft Strategic Communications Plan submitted with the Proposal.

1.1.2. The Strategic Communications Plan shall be developed with an awareness of the following issues:

a. Communication and outreach commitments made in the I-70 East EIS;

b. Presence of an environmental justice community and limited English proficient residents and business owners in close proximity to project;

c. Community "fatigue" from lengthy I-70 East EIS;

d. Diversity of stakeholders, including local residents, local governments, commuters, small and local businesses, and major national/international corporations;

e. Large, separate infrastructure projects planned near the Project area including the redevelopment of the National Western Center; and

f. Use of a public-private partnership to deliver this Project.

2. STAFF REQUIREMENTS

2.1. General Requirements

2.1.1. The Developer shall provide a full-time Project Communications Manager (PCM) with at least seven years' professional experience working on design-build construction projects and a practical understanding of construction schedules, Transportation Management Plans (TMPs), and Work performance processes; experience with and understanding of the importance of maintaining good relationships between the Project and government, businesses, residents, the general public, and other stakeholders; and experience with implementing communication and Public Involvement and Information (PI) strategies on projects of similar scope, nature, and complexity as this Project. The PCM shall be responsible for overseeing all Developer communications efforts during the Term.

2.1.2. The Developer shall provide a full-time Spanish/English bilingual Community Liaison with experience in and knowledge of the Swansea-Elyria neighborhoods. The Community Liaison shall coordinate closely with the Department and be responsible throughout the Term for ensuring that local residents, businesses and nonprofit groups are informed about the Project and have a single point of contact for all questions and concerns. The Community Liaison shall be housed at the property located on Parcel No. AP-93 and Parcel No. AP-93A (as listed in Appendix A to Schedule 18 (*Right-of–Way*)) (namely, 3600 East 46th Avenue) a minimum of three days per week (or at a frequency mutually agreed upon by the Developer and the Department) until the Project License Start Date in respect thereof (or any later date that is a reasonable period (as agreed by the Parties (acting reasonably) prior to the date that the Developer proposes to demolish such property).

2.1.3. The Developer and the Department shall jointly determine which members of the Developer's communications team shall be housed at the Developer's office or at the 3600 East 46th Avenue property and at what times in the period prior to the Project License Start Date in respect thereof (or any later date as specified in Section 2.1.2). The communications team shall be housed with the Developer's operations team during the Operating Period.

3. STAFF COORDINATION

3.1. General Requirements

3.1.1. Developer's Communications Team

Prior to the issuance of NTP1, the Developer shall submit to the Department for Information the names and resumes of all members of its communications team with assigned roles and responsibilities and provide a staff availability list covering all days and hours during the Construction Period. The Developer shall update such information quarterly during the Construction Period and annually thereafter throughout the Term (reflecting coverage during the Operating Period) and at such other times as are reasonably required to ensure that such information remains up to date.

3.1.2. Throughout the duration of the Term, the Developer shall hold weekly Strategic Communication meetings, to include the Department's Communications Team, at the Project office. At these meetings the Developer and the Department will discuss weekly communications issues and provide details for upcoming media advisories/press releases, community meetings, Lane Closure Reports, the use of personalized outreach activities, website updates and information line recordings. The agenda for each meeting shall be the responsibility of the PCM and shall be submitted to the Department in advance of each meeting.

3.1.3. Public Involvement Services Contact Sheet

The Developer shall prepare a PI Contact Sheet containing the names of appropriate Strategic Communications personnel for the Project. At a minimum, the contact list shall include the name, address, phone number(s) and email addresses for the following individuals or organizations. The PI Contact Sheet shall be submitted to the Department for Information prior to the issuance of NTP1 and updated annually throughout the Term and at such other times as are reasonably required to ensure that such information remains up to date.

a. Developer and Department;

   i. Project Director;

   ii. HPTE Director;

   iii. Project Communications Manager;

   iv. Project website administrator;

   v. Community Liaison; and

   vi. Project Colorado Transportation Management Center (CTMC) contact;

b. City and County of Denver;

   i. Mayor's Office;

   ii. Public Works;

   iii. PI Office;

   iv. Chamber of Commerce;

   v. Fire/rescue; and

   vi. Police department;

c. City of Aurora;

   i. City Manager's Office;

   ii. Public Works;

   iii. PI Office;

   iv. Chamber of Commerce;

v. Fire/rescue; and

vi. Police department;

d. City of Commerce City;

i. City Manager's Office;

ii. Public Works;

iii. Public Information Office (PIO);

iv. Chamber of Commerce;

v. Fire/Rescue; and

vi. Police Department;

e. Local State Patrol Office;

f. Local hospitals;

g. Key stakeholders: to be provided by the Department, including but not limited to the following:

i. Local schools and school districts;

ii. Businesses;

iii. Community centers;

iv. Visitor/tourist destinations;

v. Churches; and

vi. Registered Neighborhood Organizations and neighborhood associations;

h. Railroads;

i. Airports;

j. Utility Owners;

k. Commercial vehicle operators, including airport shuttles and taxi companies; and

l. Others as defined by the Department.

4. STRATEGIC COMMUNICATIONS PLANS

4.1. General Requirements

4.1.1. The Developer shall prepare and maintain an overall Strategic Communications Plan consisting of the following individual plans to ensure well-coordinated two-way communications during each phase of the project:

a. Construction Period Communications Plan (CPCP);

b. Maintenance and Operations Communications Plan (MOCP); and

c. Crisis Communications Plan (CCP).

4.1.2. Each plan shall include planned communications strategies; primary stakeholder communications lists; and identification of any PI issues and proposed outreach. Each plan shall be submitted to the Department for Approval according to the timelines provided in this Schedule. The Developer shall monitor and improve the effectiveness of each plan and resubmit for Acceptance annually upon the anniversary of the initial Approval by the Department or whenever the following conditions exist:

a. A plan or procedure no longer adequately addresses the matters it was originally intended to address;

b. A plan or procedure does not conform to the requirements of this Agreement;

c. An audit by the Developer or the Department identifies a deficiency requiring an update; or

d. Organizational structure changes require revision to a plan.

4.1.3. The Developer shall clearly identify in a cover sheet what changes were made in each update to expedite the Department's review. Also, a red line and a final copy shall be provided.

4.1.4. Each plan shall describe the basic roles and responsibilities between the Department and the Developer. In general:

a. Department Responsibilities

The Department is responsible for communicating overall vision on the Project including why the Project is needed, what Work will be done, how the Project will benefit customers, how the Project fits into the community, and how the Project fits into broader transportation plans. The Department will communicate the overall purpose of, implementation of, and education on how to use, the Tolled Express Lanes.

b. Developer Responsibilities

The Developer is responsible for communicating overall coping information during the Construction Period and the Operating Period including details about the TMP, environmental information, and other activities that affect residents and businesses.

c. Joint Department/Developer Responsibilities

The Developer shall collaborate with the Department to develop key messages related to Construction Work and O&M Work activities. The Department will have final Approval before the messages are disseminated.

i. Government Relations

Throughout the Term, all communication requests received by the Developer from Governmental Authorities shall be immediately referred to the Department (not including those requests related to Project management or coordination for Local Agency Permits). The Developer shall assist in giving timely information to the Department regarding construction Activities, and shall participate in meetings as requested.

ii. Media Requests

The Developer shall make project managers, supervisors, and other area experts available to the Department for assistance in media requests. The Developer shall also assist in media site visits and adhere to media deadlines when possible.

5. CONSTRUCTION PERIOD COMMUNICATIONS PLAN

5.1. General Requirements

5.1.1. The Developer shall prepare and maintain a CPCP to develop two-way communication of Project information with the public. The CPCP shall be used by the Developer throughout the duration of the Construction Period to manage and implement the PI process. The Developer's CPCP shall be submitted to the Department for Approval prior to the issuance of NTP 1.

5.1.2. The CPCP shall include the following:

a. Community, Government and Business Stakeholders

The Developer shall use a variety of strategic PI approaches and tools to ensure that stakeholders have accurate information about the Project schedule, progress and construction impacts, as well as address issues as they arise.

When necessary, PI strategies shall be tailored to individual stakeholders and shall specify which approaches and tools will be used to disseminate information. Specific organizations

shall be provided by the Department utilizing the database established through the I-70 East EIS. Project stakeholders include, but are not limited to, the following groups:

i. Area residents;

ii. Local and regional business owners, employees and customers;

iii. Registered Neighborhood Organizations and neighborhood associations;

iv. Local community organizations;

v. Local churches;

vi. Local schools;

vii. Property owners and property management companies;

viii. Commuters;

ix. Transportation management/advocacy organizations;

x. Denver International Airport;

xi. National Western Center;

xii. Regional Transportation District (RTD);

xiii. Traveling public;

xiv. Local, regional, and state government officials;

xv. Delivery and courier services;

xvi. Taxis, shuttles, and rental car companies;

xvii. Commercial vehicle operators, Ports of Entry and Denver Permit Office, and Colorado Motor Carriers Association;

xviii. Emergency response agencies, such as the Colorado State Highway Patrol, and local police departments, sheriff departments, fire departments, ambulance service providers, and hospitals;

xix. Tourist destinations and organizations;

xx. Colorado Department of Transportation (CDOT) employees and other internal team members, including CDOT Headquarters, the Office of Communications and the Government Relations Office;

xxi. Disadvantaged Business Enterprises and Emerging Small Businesses;

xxii. Utility Owners; and

xxiii. Railroads.

b. Key Communication Topics

i. The CPCP shall describe outreach strategies specific to the following topics:

A. Coping Strategies

The Developer shall develop and implement community and business relations strategies that communicate coping messages to stakeholders including those listed in Section 5.1.2.a of this Schedule 14. Coping messages shall focus on providing stakeholders with the information they need to make short-term and long-term decisions about how they can deal with the Construction Work and O&M Work During Construction with as little disruption as possible.

B. Environmental Information

(I) The CPCP shall describe an overall plan for communicating environmental information, including the Developer's environmental commitments, with the public. Such description shall include:

(aa) a process for responding to environment-related inquiries from stakeholders and the public;

(bb) instances when outreach tools (e.g. graphics and videos) will be developed to explain complex environmental topics; and

(cc) how environmental information will be incorporated into broader outreach tools, including public meetings and project newsletters.

(II) The CPCP shall develop a plan for coordinating any environmental mitigation requirements as provided in Schedule 17 (*Environmental Requirements*), as they pertain to stakeholders including those listed in Section 5.1.2.a of this Schedule 14, to ensure that stakeholders are aware of and participate in those areas where appropriate.

(III) The Developer shall make the Environmental Compliance Work Plan (ECWP) monthly update as provided in accordance with Schedule 17 (*Environmental Requirements*) available to the Department for posting to the Project website on a monthly basis. The Developer shall make the results of all PM10 monitors, as specified in Schedule 17 (*Environmental Requirements*), available on the Project website as specified in Schedule 17 (*Environmental Requirements*).

C. Noise

The CPCP shall develop a plan for communicating the scheduling of high noise events as well as temporary and permanent noise wall construction with individual property owners and impacted communities.

D. Coordination with Local Schools

The CPCP shall develop a plan for coordinating with the Department's Safe Routes to School Coordinator to verify walking and biking maps are up-to-date and reflect changes in access during the Construction Period. The CPCP shall develop a plan for coordinating with Denver Public Schools, and all schools within close proximity of the Project, including Swansea Elementary School, Garden Place Academy, and Bruce Randolph School.

E. Access to Transit and Pedestrian and Bicycle Routes

The CPCP shall identify a plan for communicating to the public and other associated stakeholders significant impacts and routing changes pertaining to mass transit, bicycles, pedestrian and handicap mobility.

F. National Western Center Coordination

The CPCP shall identify a strategy for coordinating with the anticipated redevelopment of the National Western Center. This strategy shall at a minimum describe the frequency of joint meetings, shared communication tools, and how lane closures and access impacts will be coordinated between the two projects. This strategy shall be developed with input from the MOT Task Force per Schedule 10, Section 2.6.

G. Cover Coordination and Outreach

The CPCP shall describe a process for continuing to engage the community in the development of the Cover. This shall include coordination with the City of Denver to involve local residents in selecting a name for the Cover as well as any final design considerations that would benefit from resident input.

H. Swansea Elementary School Coordination

The CPCP shall describe a process for engaging Swansea Elementary School staff and students throughout the Construction Period. This shall include providing safety training for school personnel, educating students about safety near construction areas, providing notification of construction activities occurring near the school, and consulting with school operations personnel on alternative travel routes.

I. Aesthetic and Design Features

The CPCP shall describe a process for inviting local artists, school children, and community members to further develop aesthetic features reflecting neighborhood identify. The CPCP shall identify which features (e.g. retaining or noise walls) will reflect this input.

5.2. Public Information Outreach Tools

The Developer shall provide a PI tool box with the flexibility to meet different stakeholder needs. The Developer shall continue to coordinate with the Department to ensure that the tools employed during the Project are effective. All PI materials shall be provided in English and Spanish, unless Approved otherwise by the Department.

a. Phone and Email

i. The Developer shall establish and maintain from the issuance of NTP2 throughout the Term a PI office equipped with a telephone, voicemail, and computers. The Project information telephone line shall be the Department's current Project hotline number. The voicemail for the project information line shall be recorded in English and Spanish and provide an updated message each week, or each day if necessary, concerning relevant completion dates and forthcoming activities on the Project and allow the recording of a message from the caller. If unable to answer the PI line, the Developer shall check and respond to voicemail messages throughout each day that construction operations and lane Closures are being carried out. During times of highly impactful construction activity or extended night work, as identified by the Department, the Developer shall provide 24-hour coverage of the PI telephone line.

ii. Throughout the Term, the Developer shall track inquiries made by citizens and businesses, including names, addresses, phone numbers, and follow-up action taken in response to inquiries; such inquiries and any follow-up action shall be entered into Dialog, a web-based contact and issue tracking database provided by the Department. The Developer shall pay for the necessary Dialog license. The system shall provide an automated report to the Department and the Developer each week. All inquiries and complaints shall be followed up with a return phone call or email from either the Developer and/or, when necessary (and as requested by the Developer or determined by the Department), the Department. The following information shall be recorded:

A. Provide the date and time of call;

B. Contact information (name, phone number, street address, and e-mail address);

C. Location and description of complaint and/or request; and

D. Response provided including date and manner of response and whether request was relayed to the Department for response.

b. Public Meetings

i. The Developer shall host and facilitate one in person public meeting within one month after the issuance of NTP2. This meeting shall have two primary purposes: 1) to introduce the Developer to the local community and 2) to seek input on defining community values per Instructions to Proposers Part B, Section 1.1.e. Additional public meetings shall be held at key times (e.g. prior to removal of the viaduct) during the Term, as identified by the Department (in consultation with the Developer). An agenda for all such meetings shall be submitted to the Department for Acceptance two weeks prior to the meeting date. The Developer shall ensure participation by the Developer's environmental team in these meetings. The Developer shall publicize these meetings through multiple means including local media, paid advertisements in newspapers, email, inserts in local newsletters, door-to-door flyers, mailers and others. The Developer shall utilize a stakeholder list, which will be provided by the Department prior to the issuance of NTP1, which will include local elected officials, city/county staff, and surrounding Local Agencies.

ii. All public meetings shall be held within the corridor boundaries; however, where relevant, the Developer shall host meetings in the neighborhood location(s) closest to the upcoming Construction Work or O&M Work. During the Construction Period, in order to remove barriers to public participation, the Developer shall provide childcare, food, and appropriate language translators at public meetings designed to achieve broad participation from Project area residents, unless it is determined by mutual agreement of the Parties that these services are not necessary.

iii. All public meetings shall inform attendees of Project plans and schedules and provide information on how to receive updates on the Project (via email address list and/or the Department's preferred email messaging system). The Developer will provide Project displays that explain information on Construction Work, environmental commitments and information, O&M Work, phasing, traffic impacts, etc. Project displays and other presentation materials used at the public meetings shall be of professional quality and designed to clearly convey accurate Project information to a non-technical audience. All displays shall be provided in English and Spanish. Copies of the most recent Project newsletter shall also be made available by the Developer at all public meetings.

iv. The Developer shall, in coordination with the Department, respond to all feasible requests to attend regular community and stakeholder meetings or community events, such as those organized by nonprofit groups and neighborhood and business associations. The Developer shall provide appropriate technical staff, as required.

c. Business Meetings

In addition to the public meetings required to be held pursuant to Section 5.2.b of this Schedule 14, the Developer shall organize and lead at least two public meetings specifically focused on local and regional business impacts within two months after the issuance of NTP2 and shall host additional meetings focused on local and regional business impacts at designated project phases (e.g. major or extended closures) as identified by the Department.

d. Social Media

The Developer shall utilize the Department's social media platforms, including Facebook and Twitter, to share information with the public. All social media posts shall be submitted

to the Department for Acceptance one Working Day in advance of inclusion on social media.

e. Stakeholder Distribution List

The Developer shall develop a master distribution list of contacts to be used for general PI, publications, and informational flyers/newsletters. The Department's database established through the I-70 East EIS shall be used as the basis for development of this list/database as well as the Department's preferred email messaging system. This list or database shall be submitted to the Department for Acceptance prior to issuance of NTP2 and updated annually throughout the duration of the Term. Through the Developer's data gathering process, the Developer shall assist the Department in supplementing the database and the preferred email messaging system.

f. Tours and Communication Events

The Developer shall, at the request of the Department, be available to participate in all media, business and government official tours of the construction areas. The Developer shall participate in the coordination and delivery of communication events (e.g. groundbreaking or grand openings). The Department will lead tours and events.

g. Lane Closure Reports

The Developer shall throughout the Term submit a Lane Closure Report each Thursday as required by Schedule 10, Section 2 (*Maintenance of Traffic*) for the following week (Saturday through Friday) for Information. This report shall be provided to the list of contacts as provided by the Department.

h. Traffic Alerts

The Developer shall throughout the Term submit a weekly traveler alert each Thursday for distribution on the Department's preferred email system and COTRIP weekly. The alert shall include I-70 Mainline, CDOT Roadways, and Local Agency Roadways and any activity that may impact the traveling public. Upcoming alerts shall be reviewed and discussed during the weekly Strategic Communications meetings.

i. WebPage Updates

The Developer shall work with the Department to develop internet web page content for a Project website developed by the Enterprises and CDOT specifically for this Project. The Developer shall provide consistent updates with the latest Project information (web page development experience is not necessary as the Developer will supply information for the Department web page template). Updates shall contain all appropriate links to/from other sites if applicable, e.g., local city, county, bus service, etc. as well as associated graphics, e.g. detour maps. The Developer will ensure the web page is updated at least weekly, and otherwise as reasonably required, with pertinent schedule information, new photos, contact information, etc. All proposed updates to the web page content shall be submitted to the Department for Acceptance two Working Days in advance of inclusion on the website.

j. Project Newsletters

Throughout the Construction Period, the Developer shall prepare and distribute a monthly newsletter. The newsletter shall be provided in English and Spanish. The first newsletter shall be distributed within 30 Calendar Days following the issuance of NTP2. The newsletter shall at a minimum provide summary information on the Project's purpose and schedule, list any upcoming job fairs or opportunities, list the Project information line, email address, web address, Project map and a construction safety message, and any other matters reasonably requested by the Department. The newsletter shall be submitted to the Department for Acceptance prior to distribution. The Department will provide the Developer a newsletter template which will include the Project's logo. The Developer shall be responsible for distributing the newsletter to the master distribution list of contacts as described in Section 5.2.e of this Schedule 14. The newsletter shall be distributed via email

once per month and distributed door-to-door to the impacted project area – approximately 2500 households—once per quarter.

k. Language Assistance for Limited English Proficient Persons

The Developer shall provide access to Limited English Proficient (LEP) persons. LEP persons are individuals for whom English is not their primary language and who have a limited ability to read, write, speak or understand English. The Developer's Community Liaison shall ensure LEP assistance for the Project including, but not limited to, translation during individual conversations and short communication materials such as door hangers or simple web updates. The Department will provide translation of all other communication materials and interpretation services at meetings. The Developer shall document all measures taken to communicate with LEP persons and record all requests for language assistance and submit details thereof in the CPCP quarterly report and the MOCP quarterly report.

l. Public Communication Collateral

The Developer shall develop a variety of outreach collateral to share information, including coping strategies, to the public as necessary for major project milestones such as long-term Closures or impactful Construction Work or O&M Work activities (i.e. nighttime noise, restricted access, Utility impacts, etc.). The Developer's Community Liaison shall work with the Department to determine which collateral shall be used. Collateral could include newsletters, fact sheets, emails, flyers, social media updates, etc. and in all cases shall be submitted to the Department for Acceptance prior to distribution. The Developer shall use the Department provided branding on all PI materials throughout the Project and adhere to the CDOT *The Colorado Brand Guidelines*. The Developer shall not use its own logos or Subcontractor logos for public communications materials. All collateral material intended for broad distribution shall include Spanish translation, provided by the Department.

m. Personalized Outreach Activities

Throughout the Construction Period the Developer shall utilize door-to-door outreach, personal phone calls and related activities. The use of these activities shall be discussed at the weekly Strategic Communication meetings and mutually agreed upon by the Developer and the Department.

n. Photos/Videos

Without prejudice to the Developer's obligations to take photos under Section 10 of Schedule 8 (*Project Administration*), the Developer shall take and submit photos/videos of the Work on regular intervals. Except as noted below, a cell phone camera is permitted. Photographs/videos may include traffic control, paving, slope repair, erosion control, bridge deck and rail work, and other key areas of work identified by the Developer, Department, and PCM for use in reports to interested agencies, social media, and flyers. A minimum of two digital photographs shall be submitted each week to the Department. The Developer shall also develop videos for public distribution to share progress of the Project either annually or at key project milestones. Developer shall also develop videos as necessary to communicate key coping strategies as directed by the Department. The Developer shall provide professional aerial photographs annually to show progress of the corridor during the Construction Period.

o. Project Identification Signing

The Developer shall provide one large project identification sign for each direction of travel along the I-70 Mainline at the Project limits. Sign layout and position shall be Accepted by the Department prior to installation. Project identification signs shall be installed within 14 Calendar Days following the issuance of NTP2. Project identification signs shall be MUTCD compliant and contain the following information:

i. Project logo;

ii. Project start and estimated completion dates; and

iii. Developer name and PI hotline number.

5.2.2. Response and Deliverables Protocol

The Developer shall comply with Table 1 in responding to communications from stakeholders and the public:

Table 1 Response Protocol

Type of Communication	Timing of Response
Hotline calls	Check messages throughout day Respond same day (initial call) or within 24 hours (including weekends if work is occurring)
Email	Same day (within two Working Days for high volume situations)
Call from Department staff	As soon as possible (no later than 24 hours)
Webpage and social media inquiries	Same day (within two Working Days for high volume situations)
Public meeting inquires	Within one week of the meeting

5.3. CPCP Quarterly Reporting

5.3.1. The Developer shall prepare a quarterly communications report during the Construction Period. The initial report shall be provided to the Department for Acceptance no later than 10 Working Days after the 90th Calendar Day following the issuance of NTP2. Each quarterly report shall be provided in English and, if requested by a member of the public, Spanish. The CPCP quarterly report shall include the following:

a. A summary of primary Construction Work and O&M Work during Construction activities performed during the preceding quarter (refer to Progress Reports as required in Schedule 8 (*Project Administration*);

b. Detailed summary of Strategic Communication efforts as part of the Progress Report activities performed during the preceding quarter;

c. Detailed summary of the ECWP as part of the Progress Report activities, environmental mitigation summary, and a list of the date and time of any PM10 alert thresholds reached or exceeded, in each case, during the preceding quarter;

d. A summary of progress in implementing the Small and Disadvantaged Business Participation Plan's Construction Contract Plan from the preceding quarter;

e. A summary of progress in implementing the Workforce Development Plan from the preceding quarter;

f. Detailed summary of number of accidents cleared during the preceding quarter; and

g. Detailed summary of measures taken to communicate with LEP persons and requests for language assistance during the preceding quarter.

6. MAINTENANCE AND OPERATIONS COMMUNICATIONS PLAN

6.1. General Requirements

6.1.1. The Developer shall prepare and maintain an MOCP in coordination with the Department to develop two-way communication of Project information with the public. This MOCP shall be used throughout the duration of the Operating Period to manage and implement the PI process. The MOCP shall be submitted to the Department for Approval prior to Substantial Completion. The MOCP shall include the following:

a. Planned Projects

This outreach consists of providing regular and continuous PI services throughout the duration of the Operating Period and must adhere to the specifications outlined in the High Performance Transportation Enterprise (HPTE) Strategic Communications and Transparency Plan. The Developer shall coordinate with the Department to determine which level of Public Information management (PIM) activities are warranted prior to commencement of planned O&M Work (including Renewal Work) projects. Two tiers of planned projects require Developer PIM activities.

i. Tier II PIM projects of medium to high impact which typically involve:

A. Moderate/High visibility from media/ public;

B. Moderate/High stakeholder involvement; and/or

C. Moderate/High impact to traveling public/ stakeholders.

Examples: Grand Ave. Bridge, I-25 in CO Springs, I-76 (Brush to Ft. Morgan), US 36 Lyons to Estes Park, US 160/US 550 CFI Durango

ii. Tier II PIM requirements apply under the following conditions:

A. The planned project is being conducted on a high-volume road with possibly a significant number of direct-access points/driveways;

B. The planned project is in or adjacent to a community's business center with high commuter/pedestrian/cycling traffic; changing work zones; variety of stakeholders (e.g., businesses, transit providers, commuters, tourists, etc.); and/or

C. The Department identifies a need for more consistent public information activities.

iii. Tier II PIM requirements

The Developer's PCM shall ensure the following activities are performed in relation to Tier II PIM projects:

A. Host a public meeting prior to commencement of, as well as (if warranted) during, the project;

B. Gather and manage a planned project specific Stakeholder Distribution List;

C. Establish a project information number for posting on static construction signs;

D. Complete a Lane Closure Report each week;

E. Deliver project flyers to those residences/businesses with direct access to highway and email to specific Users;

F. Meet with affected property owners as necessary;

G. Provide content for project web page, if warranted;

H. Answer and log calls/emails to the project information line/email address, tracking inquiries using Dialog; and

I. Assist with media relations, including providing information for or writing press releases.

iv. Tier III projects are of medium impact which typically involve:

A. Moderate visibility from media/public;

B. Moderate stakeholder involvement; and/or

C. Moderate impact to traveling public/ stakeholders.

Examples: I-25 Lane Balancing, US 287 Resurfacing, US 50 Delta to Montrose resurfacing

v. Tier III PIM requirements apply under the following conditions:

A. The planned project is being conducted on a mid-volume road with possibly a significant number direct-access points/driveways;

B. The planned project is in a location with relatively high commuter/tourist traffic, and changing work zones; and/or

C. The Department identifies a need for consistent public information.

vi. Tier III PIM requirements

The Developer's PCM shall ensure the following activities are performed in relation to Tier III PIM projects:

A. Establish a project number for construction signs;

B. Complete a Lane Closure Report each week;

C. Deliver project flyers to those residences/businesses with direct access to highway and email to specific Users;

D. Meet with affected property owners as necessary;

E. Provide content for project web page, if warranted;

F. Answer and log calls/emails to the project information line/email address, tracking inquiries using Dialog; and

G. Assist with media relations, including providing information for or writing press releases.

b. Safety-Related Complaints

The Developer shall report safety-related complaints to the Department within one Calendar Day of receipt by Developer unless the circumstance that is the subject of a complaint constitutes an immediate safety hazard in which case the Developer shall notify the Department as soon as practicable after the receipt of such complaint but in any event no later than 1 hour after receipt. The Developer shall respond to valid complaints or requests to the extent that the complaints or requests cover issues within the scope of the Developer's responsibilities under Schedule 11 (*Operations and Maintenance Requirements*). The Developer shall convey any requests for services that are beyond the scope of its obligations under this Agreement to the Department. All complaints and response shall be recorded in the Dialog system.

c. Operations and Maintenance Education

The Developer shall assist the Department in outreach and education messages to help clarify unfamiliar, complex or often misunderstood concepts related to the Project's long-term O&M, allowing the public to make informed decisions. Topics include HOV 3, Travel Demand Management, and accessing Tolled Express Lanes. Outreach must adhere to the specifications outlined in the High Performance Transportation Enterprise (HPTE) Strategic Communications and Transparency Plan.

d. Maintenance and Operations Communications Plan Quarterly Reporting

The Developer shall prepare and submit quarterly maintenance and operations communications reports during the Operating Period. The initial report shall be provided to the Department for Acceptance no later than 10 Working Days after the 90th Calendar

Day following Substantial Completion. Each quarterly report shall be provided in English and with Spanish translation, if requested by a member of the public, and shall include the following:

i. Details of primary O&M Work activities performed during the preceding quarter (refer to Progress Reports as required in Schedule 8 (*Project Administration*);

ii. Detailed summary of MOCP activities performed during the preceding quarter;

iii. Detailed summary of the ECWP as part of the Progress Report activities during the preceding quarter~~;~~

iv. A summary of progress in implementing the Small and Disadvantaged Business Participation Plan's O&M Contract Plan from the preceding quarter;

v. Detailed summary of number of accidents cleared during the preceding quarter;

vi. A summary of all calls and emails as recorded in the Dialog system; and

vii. Detailed summary of measures taken to communicate with LEP persons and requests for language assistance during the preceding quarter.

6.1.2. Emergency Maintenance

a. The MOCP shall establish a communications procedure for Emergency maintenance. The MOCP shall specify which communications tools will be utilized to communicate the impacts of repairs.

b. For Emergency maintenance, the Developer shall immediately provide the following information to the Department and the CTMC.

i. Description of the activity and why it is necessary;

ii. Start of the activity;

iii. End of the activity including any updates to the above;

iv. Impacts to traffic and property (businesses and residences);

v. Communications tools to share information (Variable Message Sign boards, GovDelivery alert, Twitter, photos, etc.); and

vi. Contact number.

c. Once work is completed the Developer shall also contact the Department's Communications Manager and the CTMC.

7. CRISIS COMMUNICATIONS PLAN

7.1. General Requirements

7.1.1. The Developer shall prepare and maintain a Crisis Communications Plan (CCP) for the Developer's response to Emergencies and incidents at any time during the Term. The Developer shall coordinate this approach with the Developer's overall Incident Management Plan. The Developer's CCP shall be submitted to the Department for Approval prior to the issuance of NTP 1.

7.1.2. In an event of a crisis, the Department will be the lead agency to handle communication with the media, public, the Department staff, etc. The Developer shall be available to help coordinate with the Department and provide information necessary to respond to the crisis.

7.1.3. The CCP shall include:

a. Types of potential Emergencies;

b. Designated staff to respond to the Emergency;

c. Approaches to addressing potential Emergencies; and

d. Boilerplate messaging that includes:

i. Cause of specific disruptions (whether construction related or not);

ii. Actions being taken to alleviate the problem;

iii. Impact to the public and notification procedures;

iv. Instructions for coping with/avoiding the impact (e.g. detours); and

v. Anticipated duration of the disruption.

7.1.4. The Developer shall provide specific details on internal coordination and communication that will occur with the Developer team, the Department, and other stakeholders.

7.1.5. Emergency Information Dissemination - Communications Tree

The CCP shall include an Emergency response telephone and email tree established by the Developer. All appropriate personnel shall be included on this communications tree for immediate response in the event of an Emergency. The telephone/email tree shall be divided into areas of expertise so the proper people are called and/or emailed for specific Emergency situations. The Project Director, PCM, and the Developer shall be included on the communications tree for notification of any Emergency that may arise. The Developer shall develop and maintain a contact list of Emergency service providers as part of its CCP. The Developer shall provide information to Emergency service providers. The Developer shall submit the Emergency response communications tree to the Department, for Acceptance, prior to the issuance of NTP 1.

8. DELIVERABLES AND PUBLIC NOTIFICATIONS

8.1. Deliverables

At a minimum, the Developer shall submit the following to the Department for Information, Acceptance, or Approval in accordance with the timeframes specified:

Table 2 Deliverables

Deliverable	Information, Acceptance, or Approval	Schedule
Developer's Communications Team Details	Information	Prior to the issuance of NTP 1. Updates submitted quarterly during the Construction Period, annually during the Operating Period and otherwise as required
Public Involvement Services Contact Sheet	Information	Prior to the issuance of NTP 1. Updates submitted annually and otherwise as required
Stakeholder Distribution List	Acceptance	Prior to the issuance of NTP 2. Updates submitted annually
Construction Period Communications Plan (CPCP)	Approval/Acceptance	Prior to the issuance of NTP 1 for Approval Updates submitted annually for Acceptance
Maintenance and Operations Communications Plan (MOCP)	Approval/Acceptance	Prior to Substantial Completion for Approval Updates submitted annually for Acceptance
CPCP Quarterly Report	Acceptance	10 Working Days after 90 Calendar Days after issuance of NTP 2; quarterly thereafter

Deliverable	Information, Acceptance, or Approval	Schedule
MOCP Quarterly Report	Acceptance	10 Working Days after 90 Calendar Days after Substantial Completion; quarterly thereafter
Crisis Communications Plan (CCP)	Approval/Acceptance	Prior to the issuance of NTP 1 for Approval Updates submitted annually for Acceptance
Emergency response communications tree	Acceptance	Prior to the issuance of NTP 1
Traffic alerts/media releases	Acceptance	Weekly by Thursday at 10:30 a.m.
Lane Closure Reports	Information	Weekly by Thursday at 10:30 a.m.
Newsletters	Acceptance	Five Working Days prior to scheduled quarterly distribution date during the Construction Period
Project identification sign layout	Acceptance	To permit installment by 14 Calendar Days following the issuance of NTP 2
Fliers, posters or other public material	Acceptance	As needed, five Working Days prior to the scheduled distribution date or, in cases of rapid response, 48 hours prior to distribution
Photos	Acceptance	Two a month or as requested Aerial photographs annually during the Construction Period
Video	Acceptance	One annually or at key project milestones
Social media posts	Acceptance	As needed, one Working Day in advance of inclusion on social media
Web page content	Acceptance	Weekly or as often as reasonably required, two Working Days in advance of inclusion on the website

8.2. Public Notification

The Developer shall comply with Table 3 in providing the following information to the public:

Table 3 Submittal Time to the Public

Deliverable	When to be published
Full road closures, detours, and major traffic impacts lasting seven Calendar Days or longer	14 Calendar Days prior to the beginning of activity in any area of the Project.
Major project activities (such as major lane shifts, bridge demolitions, etc.) lasting seven Calendar Days or less	7 Calendar Days prior to the beginning of the activity.
Other remaining types of Construction Activities in any area of the Project including: ▪ Night Work ▪ Heavy Noise Work ▪ Utilities ▪ Change of business/residential access	7 Calendar Days prior to the beginning of activity in any area of the Project or as determined jointly by the Developer and Department.
Other construction updates (e.g., cancellation of planned closures, additional lane closures, closure removals, major traffic shifts, etc.) that directly impact the public.	As soon as known with at least 24 hours' notice.

Schedule 15
Federal and State Requirements

1. GENERAL REQUIREMENTS

1.1. Civil Rights Program Manager

1.1.1. The Developer shall retain a full-time Civil Rights Program Manager ("CRPM") who shall be responsible for the day-to-day operational components of, and serve as the primary contact to the Department for, all matters and requirements concerning:

a. Davis-Bacon and related Acts (contained in Section 2.1 of this Schedule 15);

b. equal employment opportunity (contained in Section 2.2 of this Schedule 15);

c. Title VI of the Civil Rights Act (contained in Section 2.3 of this Schedule 15);

d. Americans with Disabilities Act (contained in Section 2.4 of this Schedule 15);

e. compliance with certain Federal Law requirements relating to the matters set out in Parts I through V of Appendix H to this Schedule 15 (contained in Section 2.5 of this Schedule 15);

f. small business participation and workforce development (contained in Sections 5 and 6 of this Schedule 15); and

g. community development programs (contained in Section 7 of this Schedule 15)

(together, the "Civil Rights Requirements").

1.1.2. The CRPM shall have at least three years' professional experience working on transportation-related construction projects and knowledge of small business and workforce applicable regulations and best practices to ensure compliance with all the Civil Rights Requirements.

1.1.3. The CRPM position shall be filled prior to issuance of NTP1, and remain filled through the duration of the Construction Period. The appointment of the CRPM, and any replacement thereof, shall be subject to the Department's Acceptance. Prior to Substantial Completion, the Developer shall identify the individual/position responsible for compliance with the Civil Rights Requirements for the Operating Period and keep the Department apprised of any changes during the remainder of the Term.

1.2. Meetings and Reporting

1.2.1. Construction Period Monthly Meeting Requirement

The Developer, through its CRPM, shall host monthly meetings with the Department during the Construction Period at such times and locations as are reasonably convenient to the Department. The purpose of such meetings shall be to discuss all matters concerning the Civil Rights Requirements. The Developer and the Department shall jointly set the agenda for each meeting and the Department may request the presence of specific Persons participating on the Project, as necessary.

1.2.2. Construction Period Monthly Reporting Requirements

As part of its monthly Progress Report submissions made during the Construction Period pursuant to Section 4.1 of Schedule 8 (*Project Administration*), the Developer shall submit to the Department for Acceptance all reports referenced in this Schedule 15 as applicable during the Construction Period, including as necessary to comply with the Construction Period small business participation reporting requirements contained in Appendix A to this Schedule 15, the Construction Period workforce development program reporting requirements contained in Appendix B to this Schedule 15 and the Davis-Bacon reporting requirements contained in Section 2.1.3 of this Schedule 15.

1.2.3. **Construction Period Semi-Annual Self-Assessment**

No later than each anniversary of the commencement of each Contract Year and of the date that is six months thereafter in each Contract Year during the Construction Period, the Developer shall submit to the Department:

a. for Approval, an assessment of its progress toward achieving the Construction Work Small Business Goals described in Section 6.1 of this Schedule 15; and

b. for Acceptance, an assessment of its progress toward achieving the Workforce Development Goals applicable during the Construction Period.

Additional requirements for such self-assessments are contained in Appendices A and B to this Schedule 15.

1.2.4. **Construction Period Annual Progress Review**

During the Construction Period the Developer shall participate in an annual review (on a Contract Year basis) of its progress toward achieving the Small Business and Workforce Development Goals applicable during the Construction Period. Additional requirements for such reviews are contained in Appendices A and B to this Schedule 15. Such review shall also consider the Developer's compliance with its obligations under Section 7 of this Schedule 15.

1.2.5. **Operating Period Monthly Reporting Requirement**

As part of its monthly Progress Report submissions made during the Operating Period pursuant to Section 4.1 of Schedule 8 (*Project Administration*), the Developer shall submit all reports referenced in this Schedule 15 as applicable during the Operating Period, including as necessary to comply with the Operating Period reporting requirements contained in Appendix C to this Schedule 15 and the Davis-Bacon reporting requirements contained in Section 2.1.3 of this Schedule 15.

1.2.6. **Operating Period Annual Progress Review**

During the Operating Period the Developer shall participate in an annual review (on a Contract Year basis) of its progress toward achieving the Small Business and Workforce Development Goals applicable during the Operating Period. Additional requirements for such reviews are contained in Appendix C to this Schedule 15. Such review shall also consider the Developer's compliance with its obligations under Section 7 of this Schedule 15

1.2.7. **Web-based compliance system**

During both the Construction Period and the Operating Period, the Developer shall use B2Gnow and LCPtracker, the Enterprises' web-based certified payroll and contractor compliance system, to submit Deliverables required by this Schedule 15 and to report payments to Subcontractors so as to document compliance with Section 17.5 of the Project Agreement. For any required Deliverable that is not supported by the Enterprise's B2Gnow or LCPtracker software, the applicable Deliverable shall be submitted to the Enterprises in a form mutually agreed between the Parties (both acting reasonably).

1.3. Deductions

1.3.1. **Construction Period**

Failure to Achieve Construction Work Small Business Goals

a. The failure by the Developer both (a) to achieve any Construction Work Small Business Goal as of the Substantial Completion Date and (b) to have made good faith efforts (as determined by reference to Part II of Appendix A to this Schedule 15) to achieve such goal shall result in a payment deduction pursuant to Schedule 6 (*Performance Mechanism*). The deduction shall be determined as follows (with the result to be rounded to the nearest whole number) and be calculated in accordance with Sections 2 and 3 of Part II of Appendix A to this Schedule 15:

(Relevant Construction Work Small Business Goal Percentage – Actual Percentage of Relevant Participation Achieved) x (Total Dollar Value of, as applicable to the relevant goal, all (i) Design Services or (ii) Other Construction Work or (iii) Other Construction Work and Routine O&M Work) = Amount of deduction to be assessed.

Failure to Achieve Construction Period OJT Goal

b. The failure by the Developer to achieve the Construction Period OJT Goal as of the Substantial Completion Date shall result in a payment deduction pursuant to Schedule 6 (*Performance Mechanism*). The deduction shall be determined as follows (with the result to be rounded to the nearest whole number):

(Construction Period OJT Goal – Actual OJT Employment Hours on Other Construction Work during the Construction Period calculated in accordance with Section 1 of Part III of Appendix B to this Schedule 15) x = Amount of deduction to be assessed.

Re-evaluations of Failures to Achieve Construction Work Small Business Goals and Construction Period OJT Goal

c. Any failure to achieve any Construction Work Small Business Goal or the Construction Period OJT Goal as of the Substantial Completion Date which failure resulted in a deduction as determined pursuant to, as applicable, Section 1.3.1a or 1.3.1b of this Schedule 15, is subject to re-evaluation after (i) Approval by the Department in accordance with Section 8 of Part III of Appendix A to this Schedule 15 or Section 7 of Part IV of Appendix B to this Schedule 15 of, as applicable, the Construction Period Small and Disadvantaged Business Final Report or the Construction Period Workforce Development Final Report submitted by the Developer prior to the Final Acceptance Date and (ii) the issuance of the Department's report pursuant to the relevant such Section.

Following such re-evaluation (to be made with respect to compliance as of the Final Acceptance Date, and not as of the Substantial Completion Date), the Enterprises shall recalculate any deductions previously made pursuant to Sections 1.3.1a and 1.3.1b (such recalculations to be made by reference to the Final Acceptance Date). If such recalculations result in a lower deduction relative to the relevant deduction previously made pursuant to Section 1.3.1a or Section 1.3.1b of this Schedule 15, the Developer shall be entitled to include the differential in the next Payment Request that it submits to the Enterprises as an amount payable to the Developer by the Enterprises.

1.3.2. **Operating Period**

Failure to Achieve Routine O&M Work ESB Goal

a. The failure by the Developer both (a) to have achieved the Routine O&M Work ESB Goal, as of the last date in any five Contract Year period in respect of which the Routine O&M Work ESB Goal is assessed pursuant to Section 6.2.2 of this Schedule 15, and (b) to have made good faith efforts to achieve such goal shall result in a payment deduction pursuant to Schedule 6 (*Performance Mechanism*). The deduction shall be determined as follows (with the result to be rounded to the nearest whole number):

Routine O&M Work ESB Goal – Value of Routine O&M ESB Work calculated in accordance with Section 3.b of Part I of Appendix C to this Schedule 15 = Amount of deduction to be assessed.

Failure to Achieve Renewal Work DBE Goal

b. The failure by the Developer both (a) to have achieved the Renewal Work DBE Goal, as of the last date in any five Contract Year period in respect of which the Renewal Work DBE Goal is assessed pursuant to Section 6.2.2 of this Schedule 15, and (b) to have made good faith efforts to achieve such goal shall result in a payment deduction pursuant to Schedule 6 (*Performance Mechanism*). The deduction shall be determined as follows (with the result to be rounded to the nearest whole number)

Renewal Work DBE Goal – Value of Renewal Work calculated in accordance with Section 3.b of Part II of Appendix C to this Schedule 15) = Amount of deduction to be assessed.

Failure to Achieve Renewal Work OJT Goal

c. The failure by the Developer to achieve the Renewal Work OJT Goal in respect of any Contract Year shall result in a payment deduction pursuant to Schedule 6 (*Performance Mechanism*). The deduction shall be determined as follows (with the result to be rounded to the nearest whole number):

(Renewal Work OJT Goal – Actual OJT Employment Hours on Renewal Work during applicable Contract Year calculated in accordance with Section 2 of Part III of Appendix C to this Schedule 15) x ((the then-current Davis-Bacon Minimum Wage (Basic Hourly Wage + Fringe Benefit) for a "Power Equipment Operator, Backhoe/Loader combination" in Denver County))

2. LABOR, EQUAL EMPLOYMENT OPPORTUNITY AND NON-DISCRIMINATION

2.1. Davis-Bacon and Related Acts (DBRA) Compliance

2.1.1. Application to all Construction, Alteration and Repairs

The Davis-Bacon and Related Acts (40 USC §276a; 29 CFR Parts 1, 3, 5, 6 and 7) (the "DBRA") apply to the Developer and Subcontractors performing on federally funded or assisted contracts in excess of for the construction, alteration, or repair (including painting and decorating) of public buildings or public works. The Developer shall ensure that the requirements of the DBRA, to the extent applicable to the Work being performed, are implemented on all Subcontracts throughout the Term.

2.1.2. Wage Rates

The minimum wage rates to be used for purposes of compliance with Section 2.1.1 of this Schedule 15 throughout the Construction Period are established by the U.S. Department of Labor. Current rates are attached as Appendix D to this Schedule 15.

The minimum wage rates to be used for purposes of compliance with Section 2.1.1 of this Schedule 15 throughout the Operating Period will be established by the U.S. Department of Labor . Such yearly updated minimum wage rates shall be notified to the Developer at least 60 Calendar Days prior to the commencement of each Contract Year during the Operating Period. The first such notification shall be made prior to the Substantial Completion Date and shall apply to the Contract Year during which the Substantial Completion Date occurs.

2.1.3. Compliance and Reporting

The Developer shall ensure that all employees performing work subject to DBRA classifications and rates working during the Term receive the minimum compensation required in accordance with DBRA and other Law. The Developer shall provide weekly certified payrolls to the Department throughout the Term for all activities subject to DBRA. The Developer shall, and shall ensure that each of its Subcontractors and each of their respective Subcontractors shall, pursuant to Section 19 of the Project Agreement, maintain and make available for review, inspection and audit by the Department all such Project Records as are necessary to document compliance with DBRA and other law. During the Construction Period, the CRPM shall be the person responsible for reporting this data to the Department**.**

2.2. Equal Employment Opportunity

2.2.1. Executive Order 11246

The Developer shall, and shall ensure that all Subcontractors shall, comply with all Laws that prohibit certain employment practices. In furtherance of this and in accordance with Executive Order 11246 and Appendix E to this Schedule 15, the Developer shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual

orientation, gender identity, or national origin. The provisions contained in Appendix E to this Schedule 15 shall be included in all Subcontracts without modification except as appropriate to identify the Subcontractor who will be subject to the provisions of such Subcontract.

2.2.2. **Affirmative Action**

The Developer shall take affirmative action to ensure that applicants for employment and employees are treated without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. The Developer shall, and shall ensure that all Subcontractors shall, comply with CDOT's Standard Special Provision "Affirmative Action Requirements Equal Employment Opportunity" (attached as Appendix F to this Schedule 15). Appendix F shall be included in all Subcontracts without modification except as appropriate to identify the Subcontractor who will be subject to the provisions of such Subcontract.

2.3. Title VI of the Civil Rights Act and Related Statutes

2.3.1. **Non-Discrimination Provisions**

Pursuant to Title VI of the Civil Rights Act of 1964 and related statutes, the Developer shall not, and shall ensure that none of the Subcontractors shall, exclude from participation in the Work, deny the benefits of, or subject to discrimination, any person in the United States on the ground of race, color, national origin, sex, age or disability. The Developer shall, and shall ensure that all Subcontractors shall, comply with all applicable Federal and State nondiscrimination Law and with the required terms of USDOT Order No. 1050.2A "USDOT Standard Title VI/Non-Discrimination Assurances, which are set out in Appendix G to this Schedule 15. The Developer shall include the clauses contained in Parts I through IV of Appendix G in all Subcontracts without modification except as appropriate to identify the Subcontractor who will be subject to the provisions of such Subcontract.

2.3.2. **Notice and Complaints**

The Developer shall, and shall ensure that all Subcontractors shall, report all complaints alleging discrimination on the grounds of race, color, national origin, sex, age or disability to the Department. In all facilities open to the public and on any websites (or equivalent digital media) maintained by the Developer for the Project, the Developer shall post and make available to the public CDOT's non-discrimination notice and complaint procedures.

2.4. Americans with Disabilities Act

Pursuant to Federal regulations promulgated under the authority of the Americans with Disabilities Act, 28 CFR § 35.101 et seq., the Developer, and each of its Subcontractors and each of their Subcontractors, understands and agrees that no individual with a disability shall, on the basis of the disability, be excluded from participation in this Agreement or from activities provided for under this Agreement. As a condition of accepting and executing this Agreement, the Developer agrees to comply with the "General Prohibitions Against Discrimination," 28 CFR § 35.130, and all other regulations promulgated under Title II of the Americans with Disabilities Act which are applicable to the benefits, services, programs, and activities provided by CDOT through contracts with outside contractors.

2.5. Required Federal Provisions, Federal-Aid Construction Contracts, for FHWA 1273

2.5.1. **Applicability**

As the Construction Work and Renewal Work will be financed in whole or in part with Federal funds, all the statutes, rules and regulations promulgated by the Federal government and applicable to work financed in whole or in part with Federal funds will apply to such work. In accordance with Section 1 of The "Required Contract Provisions, Federal-Aid Construction Contracts, Form FHWA 1273" ("FHWA 1273") attached as Appendix H to this Schedule 15, FHWA 1273 applies to, and shall be included in, this Agreement and (subject to Section 2.5.3 of this Schedule 15) all Subcontracts under which any part of the Construction Work or the Renewal Work is performed, excluding those Subcontracts that are purchase orders, rental agreements or other agreements for supplies or services (other than design services). FHWA 1273 applies to,

and shall be incorporated by reference in any contract, for work done under any purchase order, rental agreement, or agreement for other services.

2.5.2. **Definitions**

For purposes of Appendix H to this Schedule 15 the following terms or phrases in FHWA 1273 shall have the respective meanings set out below:

a. "Department contracting officer", "Department resident engineer", or "authorized representative of the Department" shall mean the Department or its authorized representative;

b. "contractor", "prime contractor", "bidder" or "prospective primary participant" shall mean the Developer or its authorized representative and/or the Construction Contractor or its authorized representative and/or the O&M Contractor or its authorized representative, as may be appropriate under the circumstances;

c. "contract" or "prime contract" shall mean the Construction Contract or any other Subcontract as may be appropriate under the circumstances (including any Subcontract for Renewal Work);

d. "subcontractor", "supplier", "vendor", "prospective lower tier participant" or "lower tier subcontractor" shall mean, as appropriate, contractors other than the Construction Contractor or any other Subcontractor as may be appropriate under the circumstances (including any Subcontractor performing Renewal Work); and

e. "department", "agency" or "department or agency entering into this transaction" shall mean the Department, except where a different department or agency is specified.

2.5.3. **Sections Applying to the Construction Contractor**

Sections VI.1 and VI.2 of FHWA Form 1273 shall apply only to the Construction Contractor.

2.5.4. **Compliance Reviews**

The Department will periodically conduct compliance reviews to ensure that the Developer and all Subcontractors are complying with the requirements of FHWA 1273. The Developer shall, and shall ensure that Subcontractors, remedy any noncompliance with the requirements of FHWA 1273 in a timely manner, whether or not such noncompliance is first identified by the Department.

3. COMPLIANCE WITH FHWA BUY AMERICA REQUIREMENT

3.1. General Requirement

The Developer shall, and shall cause each Subcontractor (as applicable), to comply with the FHWA Buy America Requirement in 23 CFR 635.410, which permits FHWA participation in this Agreement only if domestic steel and iron will be used on the Project. To be considered domestic, all steel and iron used and all products manufactured from steel and iron must be produced in the United States and all manufacturing processes, including application of a coating, for these materials must occur in the United States. Coating includes all processes that protect or enhance the value of the material to which the coating is applied. This requirement does not preclude a minimal use of foreign steel and iron materials, provided the cost of such materials does not exceed 0.1 % of the aggregate value of the Construction Work to be performed under the Construction Contract.

3.2. Additional Documentation Requirements

Additional Buy America documentation requirements are contained in Section 6.4.3.b.iv of Schedule 8 (*Project Administration*). Developer shall require each Subcontractor providing steel and iron material to the Project to complete and submit to Developer all certificates required for Developer to comply with its obligations under Section 6.4.3.b.iv of Schedule 8 (*Project Administration*).

4. GENERAL FEDERAL REQUIREMENTS

4.1. Non-Collusion

The provisions in this Section 4.1 are applicable to all contracts except contracts for Federal Aid Secondary Projects. Title 23, United States Code, Section 112, requires as a condition precedent to approval by the FHWA of this Agreement that each bidder file a sworn statement executed by, or on behalf of, the person, firm, association, or corporation to whom this Agreement would be awarded, certifying that such person, firm, association, or corporation has not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with the submitted bid. A form to make the non-collusion affidavit statement required by Section 112 as a certification under penalty of perjury rather than as a sworn statement as permitted by 28 U.S.C., Sec. 1746 was included in the Proposal.

4.2. Convict Produced Materials

FHWA Federal-aid projects are subject to 23 CFR § 635.417, Convict produced materials. Materials produced after July 1, 1991 by convict labor may only be incorporated in a Federal aid highway construction project if such materials have been: (i) produced by convicts who are on parole, supervised release, or probation from a prison, or (ii) produced in a prison project in which convicts, during the 12 month period ending July 1, 1987, produced materials for use in Federal aid highway construction projects, and the cumulative annual production amount of such materials for use in Federal aid highway construction does not exceed the amount of such materials produced in such project for use in Federal aid highway construction during the 12 month period ending July 1, 1987. The Developer and each Subcontractor shall comply with such requirements and the Developer agrees to include this Section 4.2 in each Subcontract, without modification except as appropriate to identify the Subcontractor who will be subject to the provisions of such Subcontract.

4.3. Access to Records and Record Retention

As required by 2 CFR Parts 200 and 1201, and without limiting the Developer's obligations under Section 19 of the Project Agreement, the Developer and its Subcontractors shall allow FHWA and the Comptroller General of the United States, or their duly authorized representatives, access to all books, documents, papers, and records of the Developer and such Subcontractors which are directly pertinent to any grantee, subgrantee or financing contract, for the purpose of making audit, examination, excerpts, and transcriptions thereof. In addition, as required by 2 CFR Parts 200 and 1201, the Developer and its Subcontractors shall retain all such books, documents, papers, and records for three years after final payment is made pursuant to any such contract and all other pending matters are closed (or, if applicable, for such longer period as is required pursuant to Sections 19.1.6 and 19.1.7 of the Project Agreement). The Developer agrees to include this Section 4.3 in each Subcontract, without modification except as appropriate to identify the Subcontractor who will be subject to the provisions of such Subcontract.

5. SMALL BUSINESS PARTICIPATION AND WORKFORCE DEVELOPMENT

5.1. Required Plans

5.1.1. Construction Period: The Developer shall submit, and obtain Approval from the Department of, a Small and Disadvantaged Business Participation Plan (for purposes of this Schedule 15, the "SDBPP") and a Workforce Development Plan (for purposes of this Schedule 15, the "WDP") prior to the issuance of NTP1. Both plans shall be consistent with and expand upon the draft plans submitted with the Proposal. Requirements for the SDBPP are contained in Appendix A to this Schedule 15 and requirements for the WDP are contained in Appendix B to this Schedule 15.

5.1.2. Operating Period: Prior to the commencement of each consecutive five Contract Year period during the Operating Period, the Developer shall submit, and obtain Approval from the Department of, a plan for achieving the Routine O&M Work ESB Goal and the Renewal Work DBE Goal applicable to such period. The first such plan is required to be submitted and Approved prior to the Substantial Completion Date and shall apply to the Contract Year during which the

Substantial Completion Date occurs and the immediately following four Contract Years. Requirements for these plans are contained in Appendix C to this Schedule 15.

5.2. Investigations

As it determines necessary, the Department may conduct reviews or investigations of participants in the Project to ensure Developer's compliance with its obligations under this Schedule 15 with respect to DBEs, ESBs, OJT and local hiring, including: the Developer; all Subcontractors; DBE and ESB firms and applicants for DBE and/or ESB certification that are not themselves Subcontractors; all OJT and local hire participants; and complainants. The Developer is required to (and shall ensure its Subcontractors and each of their Subcontractors) cooperate fully and promptly with compliance reviews, certification reviews, investigations and other requests for information, in any such case, by the Department in connection with Developer's compliance with this Section 5 and Section 6 of, and Appendices A, B and C to, Schedule 15.

5.3. Intimidation and retaliation

The Developer shall not (and shall ensure that its Subcontractors and each of their Subcontractors shall not) intimidate, threaten, coerce, or discriminate against any individual or firm for the purpose of interfering with any right or privilege secured by CDOT's DBE, ESB or OJT programs or the Project's local hiring program, each as implemented for this Project pursuant to this Schedule 15, or because the individual or firm has made a complaint, testified, assisted, or participated in any manner in an investigation, proceeding, or hearing under any such program.

5.4. Assurance of Non-Discrimination

By entering into this Agreement, the Developer agrees to the following assurance (which for purposes of Developer Default number (29) in Section 32.1.1 of the Project Agreement shall constitute a material obligation) and shall include it in all Subcontracts without modification except as appropriate to identify the Subcontractor who will be subject to the provisions of such Subcontract:

The contractor, sub-recipient or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the recipient deems appropriate, which may include, but is not limited to: (1) Withholding progress payments; (2) Assessing sanctions; (3) Liquidated damages; and/or (4) Disqualifying the contractor from future bidding as non-responsible.

5.5. OJT Program and Minimum Wages

The intent of the On-the-Job Training (OJT) program plan is to provide an innovative approach to train and upgrade females and minorities (as that term is defined in Section B.i.D. of Appendix F to this Schedule 15 in the journey worker status of the skilled crafts. Training opportunities may be provided with on-the-job trainees or duly registered apprentices.

The minimum wage rate for OJT program participants during the Construction Period is per hour, which is the equivalent to the minimum base wage rate listed for "Laborer Pipelayer" in Appendix D to this Schedule 15.

The minimum wage rates for OJT program participants during the Operating Period shall be established by the Department and notified to the Developer at least 60 Calendar Days prior to the commencement of each Contract Year during the Operating Period. The first such notification shall be made prior to the Substantial Completion Date and shall apply to the Contract Year during which the Substantial Completion Date occurs.

The Developer shall ensure that payment to all OJT program participants is not less than such minimum rates from time to time. In addition, trainees/apprentices working in the skilled crafts

must be paid the Davis-Bacon wage decision full fringe benefit rate per hour for the classification of work required by the approved program in accordance with Appendix D to this Schedule 15.

6. SMALL BUSINESS AND WORKFORCE DEVELOPMENT GOALS

6.1. Summary of Goals

The following table summarizes the goals defined in greater detail in Sections 6.2 and 6.3 of, and Appendices A, B and C to, this Schedule 15 with respect to DBEs, ESBs, OJT and local hiring.

Collectively, the Construction Work Small Business Goals, the Operating Period Small Business Goals and the Workforce Development Goals (each as separately defined in Sections 6.2 and 6.3 of this Schedule 15) are referred to herein as the "Small Business and Workforce Goals".

<table>
<tr><th></th><th>Disadvantaged Business Enterprise</th><th>Emerging Small Business</th><th>On-the-Job-Training</th><th>Local Hiring</th></tr>
<tr><th colspan="5">Construction Period</th></tr>
<tr><td>Design Services</td><td>11.6%</td><td>3%</td><td>N/A</td><td rowspan="3">760,000 total employment hours with 380,000 employment hours performed by new hires</td></tr>
<tr><td>Other Construction Work</td><td>12.5%</td><td rowspan="2">3%</td><td>200,000 employment hours</td></tr>
<tr><td>Routine O&M Work</td><td>N/A</td><td>N/A</td></tr>
<tr><th colspan="5">Operating Period</th></tr>
<tr><td>Routine O&M Work</td><td>N/A</td><td>total (indexed) for each five Contract Year period</td><td>N/A</td><td>N/A</td></tr>
<tr><td>Renewal Work</td><td>% to be established for each five Contract Year period</td><td>N/A</td><td>Number of employment hours to be established for each Contract Year</td><td>N/A</td></tr>
</table>

6.2. Small Business Goals

6.2.1. Construction Period Goals

a. As further outlined in Appendix A to this Schedule 15, the Developer shall make good faith efforts to achieve the DBE and ESB Construction Period goals set out in Section 6.1 of this Schedule 15: "DBE Design Goal" (11.6%); "ESB Design Goal" (3%); "DBE Construction Goal" (12.5%); and "ESB Construction Goal" (3%) (each as calculated pursuant to Section 2 of Part II of Appendix A to this Schedule 15) (collectively, the "Construction Work Small Business Goals"). Following consultation with the Developer, the Department may lower any of these goals at any time if it reasonably believes, upon evaluation of the DBE and ESB markets, that such goal is unachievable.

b. The Developer shall also assist in the development of DBEs and ESBs as outlined in the Developer's Approved SDBPP. The Developer shall ensure that during the Construction Period at least one of its (or its Subcontractors') employees is responsible for working with

small businesses and has three or more years of experience in small business outreach and capacity building.

6.2.2. **Operating Period Goals**

a. During the Operating Period the Developer shall make good faith efforts to achieve the Routine O&M Work ESB Goal applicable to each five Contract Year period and the Renewal Work DBE Goal applicable to each five Contract Year period (collectively, the "Operating Period Small Business Goals") as set out below. Following consultation with the Developer, the Department may lower any of these goals at any time if it reasonably believes, upon evaluation of the DBE and ESB markets, that such goal is unachievable.

Routine O&M Work ESB Goal

b. As further outlined in Appendix C to this Schedule 15, commencing with the Contract Year during which the Substantial Completion Date occurs, the Developer shall make good faith efforts to achieve total (indexed) of ESB participation in the Routine O&M Work (the "Routine O&M Work ESB Goal") during each sequential five Contract Year period during the Operating Period, with the first such period being the Contract Year during which the Substantial Completion Date occurs and the immediately following four Contract Years (provided that, if applicable, the amount of such goal shall be prorated for the first such period to account for the Substantial Completion Date occurring part way through a Contract Year).

c. The Developer and the Department shall meet at agreed upon intervals, but no less than annually, to evaluate the Developer's progress toward achieving the then applicable Routine O&M Work ESB Goal (such meeting may be the annual progress review held pursuant to Section 6 of this Schedule 15).

d. At the end of each five Contract Year period, the Department will evaluate whether the Developer has achieved the Routine O&M Work ESB Goal and its efforts to achieve such goal, in order to determine whether a payment deduction shall be made pursuant to Section 1.3.2.a of this Schedule 15. Whether or not the Developer has achieved the goal, the Developer shall submit for review by the Department documentation evidencing the good faith efforts that the Developer considers it has taken to achieve the goal.

Renewal Work DBE Goal

e. As further outlined in Appendix C to this Schedule 15, commencing with the Contract Year during which the Substantial Completion Date occurs, the Developer shall make good faith efforts to achieve the Renewal Work DBE Goal (as defined in Section 6.2.2.f of this Schedule 15) during each sequential five Contract Year period during the Operating Period, with the first such period being the Contract Year during which the Substantial Completion Date occurs and the immediately following four Contract Years (provided that, if applicable, such goal for the first such period shall take into account that the first Contract Year in such period is not a full 12 month period if the Substantial Completion Date occurs part way through a Contract Year).

f. Prior to the Substantial Completion Date, and thereafter prior to the end of each five Contract Year period referenced in Section 6.2.2.e of this Schedule 15, the Department shall notify the Developer of a goal for DBE participation on Renewal Work during each applicable period (the "Renewal Work DBE Goal"). The Department shall determine such goal based on a review of the Accepted Renewal Work Plan most recently submitted prior to the start of the first Contract Year in any such period (or, in the case of the first such period, prior to the Substantial Completion Date), together with any other relevant documentation.

g. The Developer and the Department shall meet at agreed upon intervals, but no less than annually, to evaluate the Developer's progress toward achieving the then applicable Renewal Work DBE Goal (such meeting may be the annual progress review held pursuant to Section 1.2.6 of this Schedule 15).

h. At the end of each five Contract Year period, the Department will evaluate whether Developer has achieved the Renewal Work DBE Goal and its efforts to achieve such goal, in order to determine whether a payment deduction shall be made pursuant to Section 1.3.2.b of this Schedule 15. Whether or not the Developer has achieved the goal, the Developer shall submit for review by the Department documentation evidencing the good faith efforts that the Developer considers it has taken to achieve the goal.

6.3. Workforce Development Goals

The Developer is obligated to achieve the Local Hiring Goal, the Construction Period OJT Goal and the Renewal Work OJT Goals (collectively defined as the "Workforce Development Goals"), as further detailed in this Section 6.3.

6.3.1. **Construction Period Goals**

On-the-Job Training Goal

a. The Developer shall be obligated to achieve the OJT goal for the Construction Period set out in Section 6.1 of this Schedule 15 (the "Construction Period OJT Goal "), as calculated by reference to Other Construction Work comprised of skilled craft work and otherwise in accordance with Appendix B to this Schedule 15. Failure to achieve the Construction Period OJT Goal shall result in a payment deduction pursuant to Section 1.3.1.b of this Schedule 15.

Local Hiring Goal

b. The local hiring goal for the Construction Period is 760,000 total contract employment hours with a minimum of 380,000 hours performed by new hires (the "Local Hiring Goal"), as calculated in accordance with Section 2 of Part III of Appendix B to this Schedule 15. For certainty, achievement of the Local Hiring Goal requires the Developer to have achieved both the total employment hours goal and the new hire employment hours goal. For the purposes of this Schedule 15, a new hire is any individual hired by their employer after the Agreement Date. Monetary incentives for achieving and exceeding the Local Hiring Goal are described in Section 2 of Part V of Appendix B of this Schedule 15. Local hires may be or have been participants in the OJT program.

6.3.2. **Operating Period OJT Goals**

The Developer shall be obligated to achieve the Renewal Work OJT Goal during each Contract Year period during the Operating Period, with the first such period being the Contract Year during which the Substantial Completion Date occurs (the "Renewal Work OJT Goal"), as calculated by reference to Renewal Work comprised of skilled craft work and otherwise in accordance with Appendix C to this Schedule 15. Failure to achieve the Renewal Work OJT Goal applicable to any Contract Year period shall result in a payment deduction pursuant to Section 1.3.2.c of this Schedule 15.

6.4. Assignment of Financial Deductions and Incentives to Subcontractors

Subject to the mandatory payment and dispute resolution provisions in Section 17.5 of the Project Agreement and Section 2.(b) of Part A of Schedule 16 (*Mandatory Terms*), the Developer may assign financial deductions and incentives associated with Small Business and Workforce Goals to Subcontractors pursuant to the terms of the relevant Subcontractor's Subcontract, provided that the Enterprises Accept the terms of such assignment and financial consequences prior to execution of the relevant Subcontract (provided that no such Acceptance is required with respect to any such assignment to a Principal Subcontractor). Any Developer request for the Enterprise's Acceptance shall include the relevant Subcontract terms and a description of how the Developer will monitor and assist the relevant Subcontractor's efforts at achieving the desired small business and/or workforce participation in connection with such assignment. Any such proposed assignment must also be proportionate to the amount and type of work to be provided by the relevant Subcontractor. Notwithstanding any assignment of financial deductions and incentives associated with Small Business and Workforce Goals being made, no such assignment

(including, for certainty, an assignment to a Principal Subcontractor) shall relieve the Developer of its responsibility in meeting its Small Business and Workforce Goals outlined in Sections 6.2 and 6.3 of this Schedule 15.

7. COMMUNITY DEVELOPMENT PROGRAMS

7.1. Community Development Programs

In order to contribute to the community development needs of high need neighborhoods located along the Project area and otherwise create a positive relationship between local communities and the Developer, the Developer shall spend an aggregate amount of during the Construction Period and an additional aggregate amount of (and no less than per Calendar Year or as otherwise agreed by the Parties (acting reasonably)) during the Operating Period in order to:

a. establish an organized program to assist businesses in taking advantage of the significant business opportunity provided by the local workforce during the Construction Period. This program shall include a commitment to work with restaurants, food vendors and catering businesses that are located within such neighborhoods and are likely to be impacted by the Construction Work. This program may include the following elements:

   i. Business investment revolving loans and/or grant programs;

   ii. Property access agreements for food carts and food trucks;

   iii. Coupon programs;

   iv. Advertisements; and/or

   v. Partnerships with food-access non-profits;

b. establish a college scholarship program that will benefit students enrolled during the Construction Period as students of good-standing at Swansea Elementary school. The scholarship program shall be designed for students who go on to successfully obtain a high school degree or equivalent, and who subsequently are accepted to and enroll in a two or four year associates or bachelors degree program. The Developer may partner with a foundation or other nonprofit in the management and allocation of such scholarships;

c. in partnership with Swansea Elementary school, develop and/or fund a construction education curriculum for the school designed to impart math and engineering concepts relevant to the construction of the Project; and

d. establish any other programs that it considers appropriate for the purposes of achieving the community development objective referred to above in relation to such neighborhoods.

7.2. Annual Report

The Developer shall submit, and obtain Acceptance from the Department of, a report (in a form to be agreed between the Parties, both acting reasonably) prior to NTP2, with subsequent reports to be submitted to the Department for Acceptance no later than 30 Calendar Days (1) before the end of each Contract Year that ends during the Construction Period, (2) after the Substantial Completion Date and (3) before the end of each Contract Year that ends during the Operating Period during which any of such programs remain active and, in each case, prior to the annual progress review conducted in respect of the relevant Contract Year pursuant to Section 1.2.4 or 1.2.6, as applicable, of this Schedule 15. Each such report shall (to the extent known at the time of submission of such report) describe:

a. each of the programs that has been, or will be, established by the Developer to comply with its obligations under Section 7.1 of this Schedule 15;

b. the participation and any equivalent targets that have been established in relation to each of the programs;

c. progress towards achieving such targets, both on an aggregate and a Contract Year basis; and

d. any other relevant information.

8. DELIVERABLES

At a minimum, the Developer shall submit the following to the Department for Information, Acceptance, or Approval in accordance with the specified timeframes:

Table 1. Deliverables

Deliverable	Information, Acceptance, or Approval	Schedule
Details of the Civil Rights Program Manager (CRPM)	Acceptance	Prior to the issuance of NTP1, and at the time of any replacement.
Annual EEO Report (FHWA Form PR 1391)	Acceptance	Annually by August 15 during the Construction Period and the Operating Period.
Davis-Bacon monthly payroll reports	Acceptance	Monthly during the Construction Period and the Operating Period.
Small and Disadvantaged Business Participation Plan (SDBPP)	Approval	Prior to the issuance of NTP1
Annual Small Business Commitments	Acceptance	Concurrently with the SDBPP and concurrently with the Annual Performance Progress Review Report thereafter during the Construction Period.
Small Business Commitment for each DBE and ESB	Acceptance	Concurrently with the Annual Small Business Commitments or by 10th Working Day of each month, and no earlier than 90 Calendar Days prior to the firm commencing work.
Joint Venture Commitments	Acceptance	Concurrently with the Annual Small Business Commitments or by 10th Working Day of each month, and no earlier than 90 Calendar Days prior to the firm commencing work.
Joint Check Letter	Approval	Prior to any payment intended to be made with a joint check to a DBE or ESB.
Small Business Commitment Modification	Acceptance	Prior to occurrence requiring termination or modification or, if that is not possible, within five Calendar Days of the occurrence.
Small and Disadvantaged Business monthly reports	Acceptance	No later than the tenth Working Day of each month during the Construction Period and the Operating Period.
Semi-annual small and disadvantaged business assessment	Approval	Every six months during the Construction Period.
Uniform Report of DBE Awards or Commitments and Payments Form	Acceptance	Bi-annually by May 15 and November 15.
Annual small and disadvantaged business annual performance progress review report	Approval	No later than 30 Calendar Days before the end of each Contract Year during the Construction Period and the Operating Period.

Deliverable	Information, Acceptance, or Approval	Schedule
Construction Period Small and Disadvantaged Business Final Report	Approval	No later than 30 Calendar Days prior to the Substantial Completion Date, with update as needed no later than 30 Calendar Days prior to the Final Acceptance Date.
Five-Year Routine O&M Work ESB Participation Plan	Approval	Concurrently with the Maintenance Management Plan at the commencement of each new five Contract Year period commencing with the Contract Year in which Substantial Completion occurs.
Five-Year Renewal Work DBE Participation Plan	Approval	Concurrently with the Maintenance Management Plan at the commencement of each new five-year period commencing with the Contract Year in which Substantial Completion occurs.
Small Business Commitment for each DBE on Renewal Work projects more than	Acceptance	At least two weeks prior to the commencement of construction on each Renewal Work project more than during the Operating Period.
Routine O&M Work ESB Five-Year Final Report	Approval	At the end of each sequential five Contract Year period within 30 Calendar Days after the end of the final Contract Year in such period.
Renewal Work DBE Five-Year Final Report	Approval	At the end of each sequential five Contract Year period within 30 Calendar Days after the end of the final Contract Year in such period.
Workforce Development Plan (WDP)	Approval	Prior to the issuance of NTP1.
Yearly WDP update	Approval	No later than 30 Calendar Days prior to the commencement of each Contract Year during Construction Period.
Approval form for each proposed OJT apprentice and trainee	Approval	Approval must occur before training begins
Enrollment and Residency Disclosure for each proposed local worker	Acceptance	Acceptance must occur before individual's hours may count toward the goal.
OJT monthly reports	Acceptance	Monthly during the Construction Period and the Operating Period.
Local hiring monthly reports	Acceptance	Monthly during the Construction Period.
Semi-annual workforce development assessment	Acceptance	Every six months during the Construction Period.
Construction Period Workforce Development Final Report	Approval	No later than 30 Calendar Days prior to the Substantial Completion Date, with update as needed no later than 30 Calendar Days prior to the Final Acceptance Date.

Deliverable	Information, Acceptance, or Approval	Schedule
Community Development Program report	Acceptance	Prior to the issuance of NTP2, no later than 30 Calendar Days prior to the commencement of each Contract Year during the Construction Period and the Operating Period and no later than 30 Calendar Days after Substantial Completion.
Requests to assign portions of the Small Business and Workforce Development Goals and associated deductions/incentives to Subcontractors	Acceptance	Prior to the execution of the applicable Subcontract.

9. APPENDICES

Appendix A Construction Work Small Business Goals Compliance and Plan Requirements

Appendix B Construction Period Workforce Development Goals Compliance and Plan Requirements

Appendix C Operating Period Goals Compliance and Plan Requirements

Appendix D Davis-Bacon Wage Decisions

Appendix E Executive Order No. 11246

Appendix F CDOT's Special Standard Provision for "Affirmative Action Requirements Equal Employment Opportunity"

Appendix G USDOT Standard Title VI/Non-Discrimination Assurances

Appendix H FHWA Form 1273 (Revised May 1, 2012)

Appendix A
Construction Work Small Business Goals Compliance and Plan Requirements

Part I. Small and Disadvantaged Business Participation Plan (SDBPP)

The Developer's SDBPP shall include the following:

1. Identification of the CPRM and the other team members responsible for small business program development, including:
   a. The names of the small business team members and team members' experience working with small businesses or agencies on transportation or construction projects.
   b. The roles and responsibilities of the team members, including descriptions of their activities as well as the delegated authority of the team members and how they are integrated with Key Personnel on the Project, and identification of meetings they will attend.
2. Strategic Approach for Meeting Goals during the Construction Period including:
   a. Outline of how the Developer will calculate the value of Design Services and Other Construction Work in compliance with Part II of this Appendix A.
   b. An estimated schedule for achievement of each of the Construction Work Small Business Goals. The Developer shall outline the expected participation toward achieving each goal over the Construction Period and identify an annual target for each goal for each Contract Year during the Construction Period. This outline shall set the framework for achieving the Construction Work Small Business Goals during the Construction Period.
   c. For each Construction Work Small Business Goal, a list of the areas of Work the Developer has identified for potential DBE or ESB participation with a range of the approximate percentage of the value of the applicable Construction Work relative to the value of all Construction Work. The SDBPP must reflect a reasonable approach to meeting the goals with ready, willing and able DBEs and ESBs to perform the applicable Work. The Developer shall consult the respective directories at www.coloradodbe.org and www.coloradoesb.org to ensure availability to meet the goals. If already selected, DBE or ESB team members should be identified in respect of their relevant area(s) of Work.
   d. The strategic approach to integrating achievement of small business participation into the overall approach to subcontracting, including discussion of how the Developer will communicate opportunities, create a transparent process, unbundle work to establish opportunities for small businesses, or take other actions to secure DBE and ESB participation.
   e. A description of how participation will be monitored and tracked. Describe the internal procedures through which the Developer will ensure the Construction Work Small Business Goals are met. This will include distribution of the goal responsibilities to Subcontractors, collecting data on Subcontractor participation and performance, ensuring only valid performance is counted, etc.
3. Approach to small business development and assistance including:
   a. Methods for ensuring prompt payment to all Subcontractors (for certainty, not only DBE or ESB Subcontractors), including a description as to whether and how the Developer will implement any additional prompt payment requirements, beyond those mandated in Section 17.5 of the Project Agreement, as well as the process by which the Developer will track and monitor the following: invoicing by Subcontractors; prompt payment to Subcontractors; and release of retainage. This portion of the plan shall include any efforts that the Developer and Subcontractors that are not themselves DBEs or ESBs will make to assist with mobilization efforts and early purchase of materials, or any other payment measures that will aid the viability of small business participation in the Work.

b. Assistance with bonding and insurance, including a description of any measures to be implemented by the Developer or its team members to assist DBEs and ESBs with bonding and insurance while maintaining compliance with the applicable provisions of this Agreement and the requirements of Law. This may include any of the following: adding DBEs and ESBs to insurance plans; waiving bond requirements; phased bonding; and limitations on bond and insurance requirements imposed by Subcontractors.

c. Small business outreach, training, and development, including at a minimum, a description of how Developer will:

i. conduct a mandatory outreach event directed at DBE and ESB firms after the Agreement Date and prior to the issuance of NTP2;

ii. collaborate with and utilize CDOT's established Connect2DOT Program (www.connect2dot.org);

iii. assist in the development and facilitation of a Connect2DOT Transportation Leading Edge Course for firms participating or seeking to participate in the Construction Work (see http://www.connect2dot.org/need-assistance/leading-edge for more information);

iv. regularly bring Project updates to and participate in CDOT's quarterly Small Business Collaborative Forums;

v. on a monthly basis, provide a list of upcoming subcontracting opportunities and events for distribution via the Connect2DOT newsletter;

vi. conduct any other measures of outreach, training and development and the resources dedicated to such measures; and

vii. conduct any other activities or efforts not included in the above related to achievement of the Construction Work Small Business Goals.

Part II. Good Faith Efforts, Commitments and Counting

1. Good Faith Efforts Requirement. Pursuant to Section 6.2.1 of this Schedule 15, the Developer is required to make good faith efforts to achieve the Construction Work Small Business Goals. Good faith efforts means all necessary and reasonable steps to achieve the relevant goal which, by their scope, intensity, and appropriateness to the objective, could reasonably be expected to achieve the goal, even if not fully successful. For additional guidance on how the Department will determine whether or not it considers that the Developer has made good faith efforts, see 49 CFR Part 26 Appendix A.

a. The Developer's good faith efforts toward achieving the Construction Work Small Business Goals shall be evaluated annually at a minimum but a final determination by the Department as to whether the Developer has complied with its obligation to make good faith efforts shall be made at Substantial Completion. The Department may issue a written non-compliance warning as it deems necessary if it believes the Developer is not making good faith efforts at any time during the Construction Period.

b. For each Construction Work Small Business Goal, the Developer shall submit, and obtain the Acceptance of the Department of, its annual small business commitments prior to the commencement of every Contract Year during the Construction Period. The initial list of annual small business commitments shall be submitted concurrently with the Developer's SDBPP for Acceptance by the Department prior to the issuance of NTP1. Each year thereafter, the annual small business commitments shall by submitted with the Annual Performance Progress Review Report (as required to be submitted pursuant to Section 5 of Part III of this Appendix A) no later than 30 Calendar Days prior to the commencement of each Contract Year. The annual small business commitments shall list all Small Business Commitments to DBE and ESB firms for the upcoming Contract Year sufficient to meet or exceed the annual participation target established for such year by the Developer in its SDBPP. A "Small Business Commitment" is a portion of the Design

Services or Other Construction Work, identified by dollar amount and Work area, designated by the Developer for participation by a particular DBE or ESB. For each firm listed, the Developer shall also provide a "Commitment Confirmation Form" in a form to be agreed between the Parties (both acting reasonably) (further described in Section 3 of this Part II) for Acceptance.

c. If the total eligible participation in the annual small business commitments does not meet the Developer's identified annual target, the Developer shall provide a description of the good faith efforts made to obtain commitments prior to submission of the annual small business commitments and additional good faith efforts that will be made during the current year to maintain compliance with the SBDPP. This description of good faith efforts is subject to Approval by the Department.

2. Construction Work Small Business Goal Calculation. The goals shall be calculated as follows:

a. For purposes of this Schedule 15, the Construction Work to be performed during the Construction Period shall be separated (i) into design-related activities ("Design Services") (as further defined below) and (ii) all other Work to be performed during the Construction Period under the terms of the Construction Contract (excluding, for certainty, O&M Work During Construction) ("Other Construction Work").

b. For the purposes of this Schedule 15, "Design Services" shall be comprised of all program management, construction management, feasibility study, preliminary engineering, design, engineering, surveying, mapping, and architectural related services that comprise part of the Construction Work; provided, however, that, (i) the following (or equivalent) Design Services performed by the Construction Contractor or its Subcontractors such as construction surveying, erosion control consulting, health and safety plans, and public involvement may, at the Developer's reasonable discretion, be considered Other Construction Work and (ii) the Developer may request that any other Design Services that are under the direct control of the Construction Contractor be included in the Other Construction Work subject to the Department's consent. The Developer must establish whether design-related activities under the direct control of the Construction Contractor will be considered in Design Services or Other Construction Work and make any other requests for modifications to these categories in its draft SDBPP. The Department may request additional data to verify the value of the Design Services.

c. The dollar value of the DBE Design Goal and ESB Design Goal shall each be determined by multiplying the percentage of the goal set out in Section 6.1 of this Schedule 15 by the total value of the Design Services. Subject to Section 3 of this Part II of this Appendix A, only the performance of Design Services by DBEs and ESBs, respectively, shall count toward achieving the respective goals, provided that (for certainty) the participation in the performance of Design Services by a firm that is certified as both a DBE and an ESB shall count towards the achievement of both goals.

d. The dollar value of the DBE Construction Goal and ESB Construction Goal shall each be determined by multiplying the percentage of the goal set out in Section 6.1 of this Schedule 15 by the total value of the Other Construction Work. Subject to Section 3 of this Part II of this Appendix A, only the performance of Other Construction Work by DBEs and ESBs, respectively, shall count toward achieving the respective goals, provided that (for certainty) the participation in the performance of Other Construction Work by a firm that is certified as both a DBE and an ESB shall count towards the achievement of both goals.

3. Counting Eligible Participation. Unless otherwise specified in this Appendix A, eligible DBE participation will be counted in accordance with 49 CFR 26.55. ESB participation will be counted in the same manner as DBE participation with the exception that ESBs do not have work codes and therefore are not limited to performance in certain work areas.

a. In order for the work performed by a DBE or ESB to count toward achieving a Construction Work Small Business Goal, the Developer must have an Accepted Small Business Commitment for the Work to be performed. All proposed Small Business Commitments to DBE and ESB firms must be submitted to the Department for Acceptance prior to the DBE or ESB commencing work in order for the participation to be counted toward the relevant Construction Work Small Business Goal. Once Accepted, Small Business Commitments are enforceable obligations from the Developer under this Agreement. Each DBE and ESB firm must be certified for the work to be performed upon submission of the Small Business Commitment.

i. For firms not listed in its annual small business commitments, the Developer shall submit a "Commitment Confirmation Form," in a form to be agreed between the parties (both acting reasonably), no later than the 10th Working Day of each month during the Term. The Commitment Confirmation Form must be submitted no earlier than 90 Calendar Days prior to the firm commencing work.

ii. For trucking participation by DBE and/or ESB firms, the Developer may submit an overall trucking commitment for an annual period with a list of DBE or ESB firms that will perform work under such commitment. Each DBE and ESB firm listed may provide no more than of participation under this commitment. The Developer shall submit a Commitment Confirmation Form for each listed firm and the annual overall commitment for each goal shall be submitted for Approval concurrently with its list of annual small business commitments. For any individual trucking firm with a commitment more than the Developer shall submit a separate Small Business Commitment for that firm.

b. The Work performed by a DBE or ESB must be reasonably construed to be included in the work area identified by the Developer in the Accepted Small Business Commitment. DBE firms must be certified in the applicable work code (NAICS code plus descriptor) for the work to be performed. A DBE cannot receive credit for work in an area for which it is not certified.

c. The Department's DBE Program does not permit the counting of participation by non-certified trucking firms.

d. In accordance with 49 CFR 26.55(2), the Developer shall only count a reasonable fee for contract-specific services toward achieving the relevant Construction Work Small Business Goal. Non-contract specific expenses may not be counted. In the case of temporary employment placement agencies, only the placement fee and fees for a temporary employee that will be specifically and exclusively used for work on the Project shall count toward achieving the relevant Construction Work Small Business Goal; the temporary employee's hourly fee will not count.

e. Work by a DBE or ESB firm that was not certified for the work to be performed upon execution of its Subcontract will not count toward achieving the relevant Construction Work Small Business Goal. If a DBE or ESB is decertified in the work to be performed after Acceptance of a Small Business Commitment and the execution of a Subcontract, the Developer may still count the DBE or ESB participation toward achieving the relevant Construction Work Small Business Goal.

f. If the Developer seeks to count participation by a DBE or ESB firm engaged in a joint venture, the Developer shall seek Acceptance from the Department of the joint venture's eligible participation by submitting the joint venture agreement explaining the work and management arrangement between the joint venture.

4. Commercially Useful Function ("CUF") Reviews. All DBEs and ESBs must perform a commercially useful function as defined by 49 CFR § 26.55.

a. The Developer shall monitor all DBE and ESB firms to ensure those firms are performing a CUF. The Department shall determine whether a DBE or ESB firm has performed a CUF on the Project. If the Department determines that a firm is not performing a CUF pursuant to 49 CFR § 26.55, no work performed by such firm shall count toward achieving the relevant Construction Work Small Business Goal.

b. The use of joint checks to DBEs and ESBs must be Approved by the Department before used to make a payment. The Developer shall request Approval for the use of a joint check in a written letter signed by the DBE/ESB and the Developer, stating the reason for the joint checks and the approximate number of checks that will be needed.

5. Small Business Commitment modifications. The Developer shall not terminate, reduce or otherwise modify the work to be performed under a Small Business Commitment without Acceptance from the Department. If, due to exigent circumstances, it is not possible for the Developer to seek Acceptance prior to termination, reduction or modification, the Developer shall submit to the Department a request for Acceptance within five Calendar Days of the occurrence requiring such action. Requests for Acceptance shall be made upon a form mutually agreed by the Developer and the Department (both acting reasonably).

a. Terminations and reductions include instances in which the Developer seeks to perform work originally designated for a DBE/ESB Subcontractor with its own forces, those of an Affiliate, a non-DBE/ESB firm or with another DBE/ESB firm.

i. In order to receive Acceptance of a termination or reduction, the Developer shall, at a minimum, have good cause for the termination or reduction as outlined in 49 CFR § 26.53(f).

ii. Prior to requesting Acceptance of a termination or reduction, the Developer shall provide the firm written notice of the Developer's intent to terminate or reduce the commitment and the reason for such termination or reduction, with a copy to the Department. In such notice of intent, the Developer shall provide the firm at least five Working Days to respond to the notice and to inform the Department and the Developer of the reasons, if any, why it objects to the proposed termination or reduction and any reasons why it considers that it should not be Accepted. The Developer is not required to provide the five Working Days' written notice in cases where the DBE or ESB has provided written notice that it is withdrawing. The notice period may be reduced by the Department in its discretion if required by public necessity. The Developer shall not request Acceptance until the period has passed or been waived.

b. Requests for other modifications, such as the addition of Work to be performed by the DBE or ESB, shall be made by submitting an updated Commitment Confirmation Form for Acceptance by the Department.

c. The Developer shall make good faith efforts to replace any DBE or ESB commitment that has been terminated or reduced with another DBE or ESB firm as outlined in 49 CFR § 26.53(g).

Part III. Reporting Requirements

1. Disclosure of information: In order for the Department to monitor and enforce the requirements of this Schedule 15, the Developer shall accurately track and disclose to the Department the cumulative value of the Design Services, the cumulative value of the Other Construction Work, and the value of all individual Subcontracts (and, for certainty, this requirement shall apply to all Subcontracts and not just DBE or ESB Subcontracts). The Department may verify this information by reviewing contracts and payment documents which shall be provided upon request.

2. Monthly Reporting: In accordance with Schedule 8 (*Project Administration*) the Developer shall submit a monthly summary report (in a form to be agreed between the Parties, both acting reasonably) to the Department for Acceptance no later than the tenth Working Day of each month during the Construction Period. The report shall include:

a. Subcontractor Participation and Payment: total value of (1) Design Services, (2) all Other Construction Work, (3) Routine O&M Work and (4) all other O&M Work During Construction to date (regardless of the entity that has performed such Work); a detailed breakdown of all Subcontractors (and, for certainty, this requirement shall apply to all Subcontractors and not just DBE or ESB Subcontractors) that have participated on the Project to date, separated by these same four categories of Work. It shall include:

i. firm name;

ii. whether the firm is an ESB or DBE and the Small Business Commitment amount to the firm and whether the firm is a Small Subcontractor;

iii. Subcontract amount; area of work performed; total paid to date to the firm; most recent invoice date and amount; most recent payment date and amount;

iv. identification of all parties to the relevant Subcontract and to the higher and lower tier Subcontracts associated with the Subcontract; and

v. any other relevant information to facilitate the Enterprises' assessment of compliance by the Developer with Section 17.5 of the Project Agreement in relation to the Subcontract.

b. Outreach and Upcoming Opportunities: a description of work areas on the Project for which the Developer is seeking Subcontractors. The description shall also include upcoming outreach and training events.

c. Compliance Issues Report: details of any issues that the Department should be aware of regarding DBE and ESB participation on the Project. This may include payment disputes, non-performance by DBEs and ESBs, significant scope of work changes, potential CUF concerns or other performance issues.

3. Semi-annual Assessment: In addition to the monthly report required to be submitted in the relevant month, the Developer shall, pursuant to Section 1.2.3 of this Schedule 15, also submit to the Department for Approval on a semi-annual basis an assessment of progress (in a form to be agreed between the Parties, both acting reasonably) toward achieving the Construction Work Small Business Goals, including a summary of solicitation and good faith efforts to date, and anticipated DBE and ESB participation for the next six months.

4. Uniform Report of DBE Awards or Commitments and Payments Form: By May 15 and November 15 of each year, the Developer shall submit to the Department for Acceptance a completed Uniform Report of DBE Awards or Commitments and Payments Form that has been completed in accordance with Appendix B of 49 CFR Part 26.

5. Annual Performance Progress Report and Reviews: In addition to the monthly and semi-annual reports referred to in Sections 2 and 3 of this Part III, the Developer shall submit an annual report (in a form to be agreed between the Parties, both acting reasonably) to the Department for Approval no later than 30 Calendar Days before the end of each Contract Year and prior to the annual progress review conducted in respect of such Contract Year pursuant to Section 1.2.4 of this Schedule 15, which report shall include the following information:

a. Bidders List: The Developer shall list all firms that submitted a quote to participate on the Project. The list shall include a description of the work for which the bid was submitted, whether the firm is a DBE or ESB, and whether they were selected for the work.

b. Participation Assessment: A summary and assessment of DBE and ESB participation of the past Contract Year and total to date progress made toward achieving the Construction Work Small Business Goals.

c. Strategies for continuing implementation of the SDBPP: This shall include proposed areas of work for DBEs and ESBs and outreach efforts for the next Contract Year.

d. If necessary, a request for amending the SDBPP if the Developer has not met its annual target for the current Contract Year or if the Developer has not met other commitments

detailed in the SDBPP. The request shall include a revised schedule of annual targets for each Construction Work Small Business Goal. The revised schedule of annual targets shall include a description of the Developer's approach to making up the participation not achieved during the current Contract Year.

6. Department Annual Assessment: Within 30 Calendar Days after each Annual Performance Progress Review conducted pursuant to Section 1.2.4 of this Schedule 15, the Department shall provide a written determination on the Developer's progress toward achieving the Construction Work Small Business Goals. Progress will be based on the Developer's demonstrated good faith efforts, compliance with its SDBPP and meeting the schedules and milestones described in the plan.

7. Final Report: The Developer shall submit, for Approval by the Department, its final report (in a form to be agreed between the Parties, both acting reasonably) on DBE and ESB participation during the Construction Period no later than 30 Calendar Days prior to the Substantial Completion Date. The final report shall include a summary report of total DBE and ESB participation toward achieving each of the Construction Work Small Business Goals. The report shall include the Small Business Commitment amount, the actual dollar amount paid to each DBE or ESB firm, the eligible participation amount, area of work performed, and the total value of the Design Services and Other Construction Work. In the event that Developer failed to achieve any Construction Work Small Business Goal as of the Substantial Completion Date (as determined by the Department pursuant to Section 8 of Part III of this Appendix A of this Schedule 15), the Developer shall submit, for Approval by the Department, an updated report no later than 30 Calendar Days prior to the Final Acceptance Date.

8. Department Report: Following Approval of the Developer's report (or any update thereto) submitted pursuant to Section 7 of Part III of this Appendix A, the Department will evaluate the data to determine, and issue a written report setting out its determination of, whether the Developer has (i) achieved each of the Construction Work Small Business Goals as of the Substantial Completion Date (or, as applicable, as of the Final Acceptance Date) and (ii) in relation to any such goal that has not been met, demonstrated that it has made good efforts to achieve such goal.

Appendix B
Construction Period Workforce Development Goals Compliance and Plan Requirements

Part I. Workforce Development Plan Requirements

The WDP shall at a minimum include the following elements:

1. General Plan Requirements:
   a. A written statement indicating the Developer's commitment to achieve the Construction Period OJT Goal and the Local Hiring Goal.
   b. A description of the CRPM and other team members responsible for implementing the Developer's WDP, including the name of each team member, a description of their workforce development experience, and a description of their roles and responsibilities on this Project.
   c. A description of how the Developer and all Subcontractors will recruit their workforce, including planned outreach events involving the local community. The Developer shall describe how it will work with CDOT-approved workforce development organizations to advertise job openings locally.
   d. A description of how the Developer plans to utilize Subcontractors to achieve the Construction Period OJT Goal and Local Hiring Goal.
   e. A description of how the Developer plans to utilize high school outreach programs such as Denver Public Schools' Career Connect and Arrupe Jesuit's Corporate Workforce Program to staff administrative, internship, or other opportunities.
2. On-The-Job Training Plan: With respect to OJT:
   a. Identification of the number and description of the skilled craft areas where trainees and apprentices will be used during the Construction Period on Other Construction Work.
   b. The minimum length and type of training that will be offered for each position.
   c. A description of how the Developer will monitor hours completed, training provided, and how the Developer will alleviate barriers to employment, graduation and successful permanent placement.
   d. A description of the Developer's approach to graduating participants. The Developer shall identify a target number of graduates in order to maximize participant graduation rates from the pre-approved trainee/apprenticeship programs during the Construction Period.
   e. An annual schedule indicating the distribution of training hours over each Contract Year for the duration of the Construction Period.
   f. The Developer shall describe recovery tools and methods that will be implemented should appropriate progress not be made toward the overall goal attainment.
3. Local hiring plan: With respect to local hiring
   a. Strategic approach for meeting the Local Hiring Goal, including the identification of jobs targeted for recruitment, the estimated length of employment associated with identified jobs, and an estimated schedule of the distribution of hours for the Construction Period.
   b. A description of how the Developer shall provide assistance to prospective and actual local employees to alleviate barriers to employment and to promote retention.
   c. A description of how the Developer shall monitor and track hours worked and of the internal procedures through which the Developer will ensure the Local Hiring Goal will be met. This will include distribution of the goal responsibilities to Subcontractors, collecting data on Subcontractor participation and performance, and ensuring only valid participation is counted.

d. A description of how the Developer plans to ensure compliance with the residency requirements in Section 2 of Part III of this Appendix B for workers that will count toward the Local Hiring Goal.

e. An affirmative statement that no existing employees of the Developer or any Subcontractor will be displaced or have their employment terminated as a result of the Local Hiring Goal.

4. Plan Updates. The WDP is intended to be a living document and shall be updated or revised as necessary during the course of the Construction Period, including as requested by the Department. At a minimum, an update of the WDP shall be submitted to the Department for Approval no later than 30 Calendar Days prior to the commencement of each Contract Year.

Part II. Advertisement of Job Openings

To ensure local workers are given full and fair opportunity to participate in the hiring process for vacant positions, the Developer and all Subcontractors shall advertise all job openings with Department-approved workforce development organizations for a period of seven Calendar Days before such job openings can be advertised through any other sources.

Part III. Counting goal participation

1. Counting OJT participation

a. OJT participation that counts toward satisfying the Construction Period OJT Goal shall be calculated based on the aggregate number of employment hours on Other Construction Work (excluding, for certainty, O&M Work During Construction) worked by trainees and apprentices who satisfy the requirements below.

b. The employment of the following categories of individuals by the Developer (and Subcontractors) shall count towards achieving the Construction Period OJT Goal:

i. trainees that are enrolled in a program approved by the Department and FHWA;

ii. apprentices that are enrolled and duly registered in a U.S. Department of Labor approved program; and/or

iii. trainees that are enrolled in an approved program with Colorado Contractors Association (CCA).

c. In addition, a proposed apprentice or trainee must have been Approved by the Department for such individual's participation to be counted toward achieving the Construction Period OJT Goal. Approval must occur before employment hours can be counted toward the goal. To obtain Approval for the apprentice or trainee, the Developer must submit the following to the Department for each apprentice and each trainee:

i. evidence of the registration of the trainee or apprentice into the approved training program; and

ii. the completed CDOT form for each trainee or apprentice.

d. The employment of a trainee/apprentice in a skilled craft will not be counted toward the Construction Period OJT Goal if that individual has already worked or been paid at a professional/journeyman level status for more than 6 months prior to Approval of their participation as a trainee/apprentice.

e. Before training begins, the Developer shall provide each trainee with a copy of the approved training program, pay scale, pension and retirement benefits, health and disability benefits, promotional opportunities, other employer policies and complaint procedures.

2. Counting local hiring program participation

a. For the purposes of this Schedule 15, the geographic area applicable to the Local Hiring Goal consists of the following zip codes: 80010, 80011, 80019, 80022, 80205, 80207, 80211, 80216, 80221, 80238, 80239, 80249, and 80266.

b. For a worker's hours to be eligible for the Local Hiring Goal, the individual must perform a function on the Project (whether as skilled or non-skilled labor) and meet one of the following eligibility criteria:

i. Current Resident: An individual that has resided in the local hire geographic area for a minimum of 60 consecutive Calendar Days and continues to reside in the geographic area. A current resident's hours are eligible to count toward the Local Hiring Goal for as long as the individual resides in the local hire geographic area;

ii. Former Resident: An individual that resided in the local hire geographic area for a minimum of 180 consecutive Calendar Days provided that such period of residency ended no more than one year prior to the Agreement Date. A former resident's hours are eligible to count toward the Local Hiring Goal for the duration of the Construction Period;

iii. Displaced Resident: An individual that was subjected to a Right-of-Way relocation. A displaced resident's hours are eligible to count toward the Local Hiring Goal for the duration of the Construction Period.

c. A proposed local worker must have been Accepted by the Department for such individual's hours to be counted toward the Local Hiring Goal. Acceptance must occur before the participation can be counted toward the Local Hiring Goal. To gain Acceptance, the Developer must submit the following to the Department for each local worker:

i. Completed Local Hiring Program Enrollment, in a form to be agreed between the Parties (both acting reasonably);

ii. A self-certifying Residency Disclosure, in a form to be agreed between the Parties (both acting reasonably), signed by the individual whose employment hours are to be counted toward the Local Hiring Goal; and

iii. Any additional documentation to prove residency or prior residency on a case-by-case basis as the Department determines is necessary.

d. Hours worked by local workers must be documented and reported (pursuant to Part IV of this Appendix B) to the Department in a format mutually agreed upon by the Developer and the Department (both acting reasonably).

e. The Developer shall notify the Department when an Accepted current resident worker no longer meets the eligibility requirements within 14 Calendar Days of the local worker's employer obtaining knowledge of the local worker's new residency status. The Developer may seek Acceptance for the worker to count as a former resident if eligible. Failure to notify the Department in accordance with this Section may result in all of the individual local worker's hours being disqualified from counting toward the Local Hiring Goal.

f. The Developer and all Subcontractors are prohibited from displacing or terminating existing employees to attain the Local Hiring Goal.

Part IV. Reporting requirements

1. Disclosure of Information: In order to monitor and enforce the requirements of this Schedule 15, the Developer shall disclose employment records for trainees and apprentices as well as individuals that will count toward achieving the Local Hiring Goal. The Department may verify employment records and information by reviewing personnel files as well as interviewing any individual employed by the Developer or any Subcontractor.

2. Records: The Developer shall keep records regarding the progress of the Workforce Development Plan participation on the Project, including Subcontractor participation.

3. Reports: The Developer shall submit each of the following reports for Acceptance:

    a. Monthly report: In accordance with Schedule 8 (*Project Administration*) the Developer shall submit a monthly report (in a form to be agreed between the Parties, both acting reasonably) to the Department no later than the tenth Working Day of each Month during the Construction Period. The report shall include:

        i. On-The-Job Training reports, which shall include the following, at a minimum:

            A. Total employment hours expended during the Construction Period to date separated into skilled craft employment hours, professional services employment hours, and all other employment hours.

            B. Total employment hours by trainees/apprentices expended during the Construction Period to date.

            C. Updated projected employment hours by trainees/apprentices for the Work during the Construction Period.

            D. If the projected employment hours are less than the Construction Period OJT Goal, the Developer shall provide an explanation detailing how it intends to meet the OJT participation projections outlined in its WDP, including a description of activities and other proactive measures intended to facilitate increased OJT participation.

            E. A list of current and new (i.e. since the last report) trainees/apprentices by providing full name, employer, description of services or applicable work code, start date, skilled craft program registered in (including verification of enrollment) for trainees/apprentices, total hours worked in current month, pay rate, total hours worked to date on the Project, supervisor full name, and a description of the training and performance level.

            F. Any performance problems with the training/apprenticeship participants and how the problems were resolved, including any reasons for participants leaving the Project.

            G. A list of trainees/apprentices that have graduated or successfully completed their training program, and last date worked on site.

            H. A signature by the Developer certifying the information in the report is accurate.

        ii. Local Hiring Program reports, which shall include the following, at a minimum:

            A. Total employment hours expended during the Construction Period to date separated into skilled craft employment hours, professional services employment hours, and all other employment hours.

            B. Total hours worked by individuals hired locally during the Construction Period to date, separated into skilled craft employment hours, professional service employment hours, and all other employment hours.

The Developer shall specify whether each worker is considered a new hire.

C. Projected local hiring hours to be utilized during the Construction Period.

D. If the projected local hiring hours worked are less than the Local Hiring Goal, the Developer shall provide an explanation detailing how it intends to achieve the Local Hiring Goal including any remedies necessary to meet the Local Hiring Goal.

E. A list of current newly (i.e. since the last report) employed locally hired individuals, within that month, by providing full name, address, employer, description of services or applicable work code, start date, skilled craft program registered in (including verification of enrollment for newly employed individuals) if applicable, total hours worked in current month, pay rate, total hours worked to date on the Project, supervisor full name, address verification, and a description of performance level.

F. Any performance problems with the locally hired individuals and how the problems were resolved, including any reasons for individuals leaving the Project.

G. A signature by the Developer certifying the information in the report is accurate.

4. Semi-annual Assessment: In addition to the monthly report required to be submitted in the relevant month, the Developer shall, pursuant to Section 1.2.3 of this Schedule 15, also submit to the Department for Acceptance on a semi-annual basis an assessment of progress (in a form to be agreed between the Parties, both acting reasonably) toward achieving the Workforce Development Goals applicable during the Construction Period, which shall include the following:

   a. a summary of solicitation and good faith efforts to date, effectiveness of the program, identification of areas for improvement, and recommendations for improving the WDP; and

   b. a notification as to whether the Developer considers that it has achieved any of the incentive milestones described in Sections 1.a to 1.c of Part V of this Appendix B. For any On-the-Job Training milestone reached, the Developer shall submit documentation evidencing that the trainee/apprentice has graduated from the applicable OJT Program and has since worked at least six months as a full-time journeyman on the Project in the skilled craft for which the individual graduated. Documentation shall include payrolls showing the individual worked as a fulltime journeyman.

5. Annual Performance Progress Review: The Developer shall participate in an annual meeting with the Department within 30 Calendar Days before the end of each Contract Year to review its progress with its Workforce Development Plan and toward achieving the Workforce Development Goals applicable during the Construction Period. Within 30 Calendar Days after the annual performance review meeting, the Department will provide a written assessment as to whether the Developer has made adequate progress toward achieving the Construction Period OJT Goal and the Local Hiring Goal. Progress will be based on the Developer's demonstrated efforts with implementing its Workforce Development Plan and meeting the schedules and milestones described within the Workforce Development Plan.

6. Final Report: The Developer shall submit, for Approval by the Department, its final report (in a form to be agreed between the Parties, both acting reasonably) on OJT and local hiring participation during the Construction Period no later than 30 Calendar Days prior to the Substantial Completion Date. The final report shall include total participation data through Substantial Completion. In the event that the Developer failed to achieve either the Local Hiring Goal or the Construction Period OJT Goal as of the Substantial Completion Date (as determined by the Department pursuant to Section 7 of this Appendix B), the Developer shall submit, for

Approval by the Department, an updated report no later than 30 Calendar Days prior to the Final Acceptance Date.

7. Department Report: Following Approval of the Developer's report (or any update thereto) submitted pursuant to Section 6 of this Appendix B, the Department will evaluate the data to determine, and issue a written report setting out its determination of, whether the Developer has achieved as of the Substantial Completion Date (or, as applicable, as of the Final Acceptance Date) each of the Local Hiring Goal and the Construction Period OJT Goal. Such report shall also confirm whether or not the Developer is entitled to be paid any incentive payment(s) pursuant to Section 2 of Part V of this Appendix B and, if so entitled, the amount thereof (including relevant calculations).

Part V. Monetary Incentives for Workforce Participation

1. Monetary incentives for On-the-Job Training Participation:

   a. The Enterprises shall pay the Developer the applicable monetary incentive set out below for reaching one of the following milestones by the end of the third Contract Year of the Construction Period:

      i. for achieving a total of 120,000 employment hours and graduating and retaining for at least six months after graduation 21 individuals; or

      ii. for achieving a total of 120,000 employment hours and graduating and retaining for at least six months after graduation 23 individuals; or

      iii. for achieving a total of 120,000 employment hours and graduating and retaining for at least six months after graduation 25 individuals.

   b. The Enterprises shall pay the Developer the applicable monetary incentive set out below for reaching one of the following milestones by the end of the fourth Contract Year of the Construction Period:

      i. for achieving a total of 160,000 employment hours and graduating and retaining for at least six months after graduation 31 individuals; or

      ii. for achieving a total of 160,000 employment hours and graduating and retaining for at least six months after graduation 33 individuals; or

      iii. for achieving a total of 160,000 employment hours and graduating and retaining for at least six months after graduation 35 individuals.

   c. The Enterprises shall pay the Developer the applicable monetary incentive set out below for reaching one of the following milestones by Substantial Completion:

      i. for achieving a total of 200,000 employment hours and graduating and retaining for at least six months after graduation 41 individuals; or

      ii. for achieving a total of 200,000 employment hours and graduating and retaining for at least six months after graduation 43 individuals; or

      iii. for achieving a total of 200,000 employment hours and graduating and retaining for at least six months after graduation 45 individuals.

   d. For purposes of this Section 1:

      i. eligible employment hours shall be calculated in accordance with Section 1 of Part III of this Appendix B;

      ii. graduation means the individual has completed his or her training or apprenticeship program described in Section 1 of Part III of this Appendix B and has reached full journeyman status; and

      iii. retention means the individual is working full-time on the Project as a journeyman in the skilled craft for which they graduated.

e. Any amount payable pursuant to this Section 1 shall be paid no later than 45 Calendar Days after receipt by the Enterprises of an invoice from the Developer for the relevant amount, provided that the Developer shall not be entitled (i) to deliver such an invoice until after the Department has issued an assessment pursuant to Section 5 of Part IV of this Appendix B confirming that the Developer is entitled to such a payment and (ii) to any such payment earlier than the end of the relevant Contract Year by reference to which the relevant milestone is to be determined.

2. Monetary incentives for Local Hiring participation:

a. The Enterprises shall pay the Developer for achieving the Local Hiring Goal.

b. The Enterprises shall pay the Developer for every local employment hour worked by a new hire (as defined in Section 6.3.1.b of this Schedule 15) achieved in excess of the Local Hiring Goal, with a total maximum incentive payment payable pursuant to this Section 2.b of

c. Any amount payable pursuant to this Section 2 shall be paid no later than 45 Calendar Days after receipt by the Enterprises of an invoice from the Developer for the relevant amount, provided that the Developer shall not be entitled to deliver such an invoice until after the Department has issued a report pursuant to Section 7 of Part IV of this Appendix B that confirms the Developer's entitlement to such a payment.

Appendix C
Operating Period Goals Compliance and Plan Requirements

Part I. Routine O&M Work ESB Goals and Requirements

1. Routine O&M Work ESB Goal: Pursuant to Section 6.2.2 of this Schedule 15, the Developer is required to make good faith efforts to achieve the Routine O&M Work ESB Goal applicable to each sequential five Contract Year period during the Operating Period. Good faith efforts means all necessary and reasonable steps to achieve the goal which, by their scope, intensity, and appropriateness to the objective, could reasonably be expected to achieve the goal, even if not successful. For additional guidance on how the Department will determine whether or not it considers that the Developer has made good faith efforts, see 49 CFR Part 26 Appendix A.

2. Five-Year Routine O&M Work ESB Participation Plan: Commencing with the Contract Year in which Substantial Completion occurs, the Developer shall submit the following information for Approval at the same time as it submits its Maintenance Management Plan prior to the commencement of each new five Contract Year period:

    a. An estimated schedule for achievement of the Routine O&M Work ESB Goal applicable to the relevant five Contract Year period. The Developer shall outline the expected participation toward achieving the goal. This outline shall set the framework for achieving the Routine O&M Work ESB Goal during such period.

    b. A list of the areas of Work the Developer has identified for potential ESB participation and approximate dollar value of each area.

    c. A description of how participation will be monitored and tracked and the internal procedures through which the Developer will ensure the goal is met. This will include distribution of goal responsibilities to Subcontractors, collecting data on Subcontractor participation and performance, and ensuring only valid performance is counted.

    d. Methods for ensuring prompt payment to all Subcontractors (for certainty, not only ESB Subcontractors) performing O&M Work After Construction (other than Renewal Work) (for certainty, not just Routine O&M Work) during the Operating Period, including a description as to whether and how the Developer will implement any additional prompt payment requirements, beyond those mandated in Section 17.5 of the Project Agreement, as well as the process by which the Developer will track and monitor the following: invoicing by Subcontractors; prompt payment to Subcontractors; and release of retainage. This portion of the plan shall include any efforts that the Developer and Subcontractors that are not themselves ESBs will make to assist with mobilization efforts and early purchase of materials, or any other payment measures that will aid the viability of small business participation in the Work.

3. Commitments and Counting

    a. Commitments. In order for the work performed by an ESB to count toward achieving the applicable Routine O&M Work ESB Goal, the Developer must have an Accepted Small Business Commitment for the Routine O&M Work to be performed. A “Small Business Commitment” is a portion of the Routine O&M Work, identified by dollar amount and Work area, designated by the Developer for participation by a particular ESB.

        i. All proposed Small Business Commitments to ESB firms must be submitted to the Department for Acceptance via a “Commitment Confirmation Form”. The Commitment Confirmation Form must be Accepted by the Department prior to the ESB commencing work in order for the participation to be counted toward the applicable Routine O&M Work ESB Goal. Once Accepted, Small Business Commitments are enforceable obligations of the Developer under this Agreement. Each ESB firm must be certified for the work to be performed upon submission of the Small Business Commitment.

ii. Commitment Confirmation Forms shall be submitted to the Department for Acceptance no later than the 10th Working Day of each month during the Term. The Commitment Confirmation Form must be submitted no earlier than 90 Calendar Days prior to the firm commencing work.

b. Counting Eligible Participation. Unless otherwise specified in this Appendix C, eligible ESB participation will be counted in accordance with 49 CFR 26.55. ESB participation will counted in the same manner as DBE participation with the exception that ESB firms do not have work codes and therefore are not limited to performance in certain work areas.

i. If the Developer seeks to count participation by an ESB firm engaged in a joint venture, the Developer shall seek Acceptance from the Department of the joint venture's eligible participation by submitting the joint venture agreement explaining the work and management arrangement between the joint venture.

ii. The Developer shall only count a reasonable fee for contract-specific services toward achieving the applicable Routine O&M Work ESB Goal. Non-contract specific expenses may not be counted. In the case of temporary employment placement agencies, only the placement fee and fees for a temporary employee that will be specifically and exclusively used for work on the Project shall count toward achieving the applicable Routine O&M Work ESB Goal; the temporary employee's hourly fee will not count.

iii. If an ESB is decertified from the ESB program after Acceptance of a Small Business Commitment and the execution of a Subcontract, the Developer may still count the ESB participation toward achieving the applicable Routine O&M Work ESB Goal.

c. Commercially Useful Function ("CUF") Reviews. The Department applies the DBE requirement from 49 CFR § 26.55 to all ESB firms. The Developer shall monitor all ESB firms to ensure those firms are performing a CUF. The Department shall determine whether an ESB firm has performed a CUF on the Project. If the Department determines that a firm is not performing a CUF pursuant to 49 CFR § 26.55, no work performed by such firm shall count toward achieving the Routine O&M Work ESB Goal.

d. The use of joint checks to ESBs must be Approved by the Department before they are used to make a payment. The Developer shall request Approval for the use of a joint check in a written letter signed by the ESB and the Developer, stating the reason for the joint checks and the approximate number of checks that will be needed.

e. Small Business Commitment modifications. The Developer shall not terminate, reduce or otherwise modify the work to be performed under a Small Business Commitment without Acceptance from the Department. If, due to exigent circumstances, it is not possible for the Developer to seek Acceptance prior to termination, reduction or modification, the Developer shall submit to the Department a request for Acceptance within five Calendar Days of the occurrence requiring such action. Requests for Acceptance shall be made upon a form mutually agreed by the Developer and the Department (both acting reasonably).

i. Terminations and reductions include instances in which the Developer seeks to perform work originally designated for an ESB Subcontractor with its own forces, those of an Affiliate, a non-ESB firm or with another ESB firm.

ii. In order to receive Acceptance of a termination or reduction, the Developer shall, at a minimum, have good cause for the termination or reduction as outlined in 49 CFR § 26(f).

iii. Prior to requesting Acceptance of a termination or reduction, the Developer shall provide the firm written notice of the Developer's intent to terminate or reduce the commitment and the reason for such termination or reduction, with a copy to the Department. In such notice of intent, the Developer shall provide the firm at least

five Working Days to respond to the notice and to inform the Department and the Developer of the reasons, if any, why it objects to the proposed termination or reduction and any reasons why it considers that it should not be Accepted. The Developer is not required to provide the five Working Days' written notice in cases where the ESB has provided written notice that it is withdrawing. The notice period may be reduced by the Department in its discretion if required by public necessity. The Developer shall not request Acceptance until the period has passed or been waived.

iv. Requests for other modifications, such as the addition of Work to be performed by the ESB, shall be made by submitting an updated Commitment Confirmation for Acceptance by the Department.

v. The Developer shall make good faith efforts to replace any ESB commitment that has been terminated or reduced with another ESB firm as outlined in 49 CFR § 26.53(g).

4. Reporting Requirements

a. Monthly Reporting. In addition to the monthly reporting requirements contained in Section 13 of Schedule 11, the Developer shall, at the same time as complying with such requirements, submit a monthly report (in a form to be agreed between the Parties, both acting reasonably) to the Department for Acceptance during the Operating Period, which shall include the following information:

i. Subcontractor Participation and Payment: total value of Routine O&M Work to date during the applicable five Contract Year period, a detailed breakdown of all Subcontractors (and, for certainty, this requirement shall apply to all Subcontractors and not just ESB Subcontractors) that have participated on the Project during the five Contract Year period to date. It shall include:

1. firm name;

2. whether the firm is an ESB and the Small Business Commitment amount to the ESB;

3. Subcontract amount; area of work performed; total paid to date to the firm; most recent invoice date and amount; and most recent payment date and amount.

4. Identification of all subcontracting parties and the higher and lower tiered contracts associated with the Subcontract.

ii. Outreach and Upcoming Opportunities: a description of work areas on the Project for which the Developer is seeking ESB Subcontractors. The description shall also include upcoming outreach and training events if applicable.

iii. Compliance Issues Report: details of any issues that the Department should be aware of regarding ESB participation on the Project. This may include payment disputes, non-performance by ESBs, and significant scope of work changes, potential CUF concerns or other performance issues.

b. Annual Progress Review Report: In addition to the monthly report required to be submitted in the relevant month pursuant to Section 4.a. of Part I of this Appendix C, the Developer shall submit an annual report (in a form to be agreed between the Parties, both acting reasonably) to the Department for Approval no later than 30 Calendar Days before the end of each Contract Year and prior to each annual progress review conducted in respect of such Contract Year pursuant to Section 1.2.6 of this Schedule 15, which report shall include the following information:

i. Bidders List: The Developer shall list all firms that submitted a quote to participate on the Project. The list shall include a description of the work for

which the bid was submitted, whether the firm is a DBE or ESB, and whether they were selected for the work.

ii. Participation Assessment: A summary and assessment of ESB participation of the past Contract Year and total to date progress made toward achieving the applicable ESB Routine O&M Work Goal.

iii. Summary of solicitation and good faith efforts to date.

iv. Anticipated ESB participation for the remainder of the current five Contract Year period.

v. If necessary, a request for amending the ESB Routine O&M Work Plan for the applicable period if the Developer believes it is not on target to meet the applicable goal or if the Developer has not met other commitments detailed in the plan. The request shall include a revised schedule for attaining the goal and a description of the Developer's approach to making up the participation.

c. Department Annual Assessment: Within 30 Calendar Days after each Annual Performance Progress Review conducted pursuant to Section 1.2.6 of this Schedule 15, the Department shall provide a written determination on the Developer's progress toward achieving the Routine O&M Work ESB Goal for the applicable period. Progress will be based on the Developer's demonstrated good faith efforts, compliance with its five-year Routine O&M Work ESB Participation Plan, and meeting the schedules and milestones described in the plan.

d. Five-Year Period Final Report: The Developer shall submit, for Approval by the Department, its final report (in a form to be agreed between the Parties, both acting reasonably) on ESB participation at the end of each sequential five Contract Year period within 30 Calendar Days after the end of the final Contract Year in such period. The final report shall include a summary report of total participation toward achieving the Routine O&M Work ESB Goal for the applicable period. The report shall include the Small Business Commitment amount, the actual dollar amount paid to each ESB firm, the eligible participation amount, and area of work performed.

e. Department Five-Year Report: Following Approval of the Developer's five-year period final report, the Department will evaluate the data to determine, and issue a written report setting out its determination of, whether the Developer has (i) achieved the Routine O&M Work ESB Goal for the applicable period and (ii) if the goal has not been met, demonstrated that it has made good faith efforts to achieve the goal.

Part II. Renewal Work DBE Goals and Requirements

1. Renewal Work DBE Goal

a. The Department shall establish a Renewal Work DBE Goal to apply during each sequential five Contract Year period during the Operating Period, with the first such period being the Contract Year during which the Substantial Completion Date occurs and the immediately following four Contract Years. Each goal will be set in accordance with 49 CFR § 26.45(e)(3) and based on information contained in submittals required to be submitted by the Developer pursuant to Schedule 8 and Schedule 11.

b. The Developer shall participate in a meeting with the Department at least 180 Calendar Days prior to the commencement of each new five Contract Year period to discuss the establishment of a new Renewal Work DBE Goal. At the meeting, the Developer may provide data to supplement its most recent Maintenance Management Plan. At the request of the Department, the Developer shall participate in any consultation and public participation efforts taken by the Department pursuant to 49 CFR 26.45(g).

c. The Department shall notify the Developer of the applicable Renewal Work DBE Goal for the upcoming five Contract Year period at least 60 Calendar Days prior to the commencement of the new five Contract Year period.

d. In accordance with Section 6.2.2.e of this Schedule 15, the Developer shall make good faith efforts to achieve the Renewal Work DBE Goal applicable to each sequential five Contract Year period during the Operating Period. Good faith efforts means all necessary and reasonable steps to achieve the goal which, by their scope, intensity, and appropriateness to the objective, could reasonably be expected to achieve the goal, even if not successful. For additional guidance on how the Department will determine whether or not it considers that the Developer has made good faith efforts, see 49 CFR Part 26 Appendix A.

2. Five-year Period Renewal Work DBE Participation Plan: Commencing with the Contract Year in which Substantial Completion occurs, the Developer shall submit the following information for Approval with its Maintenance Management Plan at the commencement of each new five-year period:

a. An estimated schedule for achievement of the Renewal Work DBE Goal applicable to the relevant five Contract Year period. The Developer shall outline the expected participation toward achieving the goal. This outline shall set the framework for achieving the Renewal Work DBE Goal during such period.

b. A list of the areas of Work the Developer has identified for potential DBE participation and approximate dollar value of each area.

c. The strategic approach for integrating DBE participation into the overall approach to subcontracting, including discussion of how the Developer will communicate opportunities to DBE firms, create a transparent process, unbundle work to establish opportunities for DBE firms, or other actions to secure DBE participation.

d. A description of how participation will be monitored and tracked and the internal procedures through which the Developer will ensure the goal is met. This will include distribution of goal responsibilities to Subcontractors, collecting data on Subcontractor participation and performance, and ensuring only valid performance is counted.

e. Methods for ensuring prompt payment to all Subcontractors (for certainty, not only DBE Subcontractors) performing Renewal Work during the Operating Period, including a description as to whether and how the Developer will implement any additional prompt payment requirements, beyond those mandated in Section 17.5 of the Project Agreement, as well as the process by which the Developer will track and monitor the following: invoicing by Subcontractors; prompt payment to Subcontractors; and release of retainage. This portion of the plan shall include any efforts that the Developer and Subcontractors that are not themselves DBEs will make to assist with mobilization efforts and early purchase of materials, or any other payment measures that will aid the viability of small business participation in the Work.

3. Commitments and Counting

a. Commitments. In order for the work performed by a DBE to count toward achieving the Renewal Work DBE Goal, the Developer must have an Accepted Small Business Commitment for the Renewal Work to be performed. A “Small Business Commitment” is a portion of the Renewal Work, identified by dollar amount and Work area, designated by the Developer for participation by a particular DBE.

i. All proposed Small Business Commitments to DBE firms must be submitted to the Department for Acceptance via a “Commitment Confirmation Form.” The Commitment Confirmation Form must be Accepted by the Department prior to the DBE commencing work in order for the participation to be counted toward the Renewal Work DBE goal. Once Accepted, Small Business Commitments are enforceable obligations from the Developer to the Department under this Agreement. Each DBE firm must be certified for the work to be performed upon submission of the Small Business Commitment.

ii. For Renewal Work projects of more than the Developer shall submit a list of commitments along with a Commitment Confirmation Form for each listed firm at least two weeks prior to the commencement of construction on the Renewal Work project.

iii. For all other DBE commitments, Commitment Confirmation Forms shall be submitted to the Department for Acceptance no later than the 10th Working Day of each month during the Term. The Commitment Confirmation Form must be submitted no earlier than 90 Calendar Days prior to the firm commencing work.

b. Counting Eligible Participation. Unless otherwise specified in this Appendix C, eligible DBE participation will be counted in accordance with 49 CFR 26.55.

i. If the Developer seeks to count participation by a DBE firm engaged in a joint venture, the Developer shall seek Acceptance from the Department of the joint venture's eligible participation by submitting the joint venture agreement explaining the work and management arrangement between the joint venture.

ii. In accordance with 49 CFR 26.55(2), the Developer shall only count a reasonable fee for contract-specific services toward achieving the Renewal Work DBE Goal. Non-contract specific expenses may not be counted. In the case of temporary employment placement agencies, only the placement fee and fees for a temporary employee that will be specifically and exclusively used for work on the Project shall count toward achieving the relevant Renewal Work DBE Goal; the temporary employee's hourly fee will not count.

iii. Work by a DBE firm that was not certified for the work to be performed upon execution of its Subcontract will not count toward achieving the relevant goal. If a DBE is decertified from the DBE program after Acceptance of a Small Business Commitment and the execution of a Subcontract, the Developer may still count the DBE participation toward achieving the Renewal Work DBE Goal.

iv. If the Developer seeks to count participation by a DBE firm engaged in a joint venture, the Developer shall seek Acceptance from the Department of the joint venture's eligible participation by submitting the joint venture agreement explaining the work and management arrangement between the joint venture.

c. Commercially Useful Function ("CUF") Reviews. The Developer shall monitor all DBE firms to ensure those firms are performing a CUF. The Department shall determine whether a DBE firm has performed a CUF on the Project. If it determines that a firm is not performing a CUF pursuant to 49 CFR § 26.55, no work performed by such firm shall count toward achieving the goal.

d. The use of joint checks to DBEs must be Approved by the Department before they are used to make a payment. The Developer shall request Approval for the use of a joint check in a written letter signed by the DBE and the Developer, stating the reason for the joint checks and the approximate number of checks that will be needed.

e. Small Business Commitment modifications. The Developer shall not terminate, reduce or modify the work to be performed under a Small Business Commitment without Acceptance from the Department. If, due to exigent circumstances, it is not possible for the Developer to seek Acceptance prior to termination, reduction or modification, the Developer shall submit to the Department a request for Acceptance within five Calendar Days of the occurrence requiring such action. Requests for Acceptance shall be made upon a form mutually agreed by the Developer and the Department (both acting reasonably).

i. Terminations and reductions include instances in which the Developer seeks to perform work originally designated for a DBE Subcontractor with its own forces, those of an Affiliate, a non-DBE firm or with another DBE firm.

ii. In order to receive Acceptance of a termination or reduction, the Developer shall, at a minimum, have good cause for the termination or reduction as outlined in 49 CFR § 26 (f).

iii. Prior to requesting Acceptance of a termination or reduction, the Developer shall provide the firm written notice of the Developer's intent to terminate or reduce the commitment and the reason for such termination or reduction, with a copy to the Department. In such notice of intent, the Developer shall provide the firm at least five Working Days to respond to the notice and to inform the Department and the Developer of the reasons, if any, why it objects to the proposed termination or reduction and any reasons why it considers that it should not be Accepted. The Developer is not required to provide the five Working Days' written notice in cases where the DBE has provided written notice that it is withdrawing. The notice period may be reduced by the Department in its discretion if required by public necessity. The Developer shall not request Acceptance until the period has passed or been waived.

iv. Requests for other modifications, such as the addition of Work to be performed by the DBE, shall be made by submitting an updated Commitment Confirmation for Acceptance by the Department.

v. The Developer shall make good faith efforts to replace any DBE commitment that has been terminated or reduced with another DBE firm as outlined in 49 CFR § 26.53(g).

4. Reporting Requirements

a. Monthly Reporting. In addition to the monthly reporting requirements contained in Section 13 of Schedule 11, the Developer shall, at the same time as complying with such requirements, submit a monthly report (in a form to be agreed between the Parties, both acting reasonably) to the Department for Acceptance during the Operating Period which shall include the following information:

i. Subcontractor Participation and Payment: total value of (1) Renewal Work and (2) other O&M Work After Construction to date during the applicable five Contract Year period; a detailed breakdown of all Subcontractors (and, for certainty, this requirement shall apply to all Subcontractors and not just DBE Subcontractors) that have participated on the Project during the five Contract Year period to date, separated by these same two categories of Work. It shall include:

1. firm name;

2. whether the firm is a DBE and the Small Business Commitment amount to the DBE, and whether the firm is a Small Subcontractor or an ESB;

3. Subcontract amount; area of work performed; total paid to date to the firm; most recent invoice date and amount; and most recent payment date and amount;

4. identification of all parties to the relevant Subcontract and the higher and lower tiered Subcontracts associated with the Subcontract; and

5. any other relevant information to facilitate the Enterprises' assessment of compliance by the Developer with Section 17.5 of the Project Agreement in relation to the Subcontract.

ii. Outreach and Upcoming Opportunities: a description of work areas on the Project for which the Developer is seeking DBE Subcontractors. The description shall also include upcoming outreach and training events if applicable.

iii. Compliance Issues Report: details of any issues that the Department should be aware of regarding DBE participation on the Project. This may include payment

disputes, non-performance by DBEs, and significant scope of work changes, potential CUF concerns or other performance issues.

b. Annual Progress Review Report: In addition to the monthly report required to be submitted in the relevant month pursuant to Section 4.a of Part II of this Appendix C, the Developer shall submit an annual report (in a form to be agreed between the Parties, both acting reasonably) to the Department for Approval no later than 30 Calendar Days before the end of each Contract Year and prior to the annual progress review conducted in respect of such Contract Year pursuant to Section 1.2.6 of this Schedule 15, which shall include the following information:

i. Bidders List: The Developer shall list all firms that submitted a quote to participate on the Project. The list shall include a description of the work for which the bid was submitted, whether the firm is a DBE or ESB, and whether they were selected for the work.

ii. Participation Assessment: A summary and assessment of DBE participation of the past Contract Year and total to date progress made toward achieving the applicable Renewal Work DBE Goal.

iii. Summary of solicitation and good faith efforts to date.

iv. Anticipated DBE participation for the remainder of the current five Contract Year period.

v. If necessary, a request for amending the DBE Renewal Work Plan for the applicable period if the Developer believes it is not on target to meet the applicable goal or if the Developer has not met other commitments detailed in the plan. The request shall include a revised schedule for attaining the goal and a description of the Developer's approach to making up the participation.

c. Department Annual Assessment: Within 30 Calendar Days after each Annual Performance Progress Review conducted pursuant to Section 1.2.6 of this Schedule 15, the Department shall provide a written determination on the Developer's progress toward achieving the Renewal Work DBE Goal for the applicable period. Progress will be based on the Developer's demonstrated good faith efforts, compliance with its five-year Renewal Work DBE Participation Plan, and meeting the schedules and milestones described in the plan.

d. Five-year Period Final Report: The Developer shall submit, for Approval by the Department, its final report (in a form to be agreed between the Parties, both acting reasonably) on DBE participation at the end of each sequential five Contract Year period within 30 Calendar Days after the end of the final Contract Year in such period. The final report shall include a summary report of total participation toward achieving the Renewal Work DBE Goal for the applicable period. The report shall include the Small Business Commitment amount, the actual dollar amount paid to each DBE firm, the eligible participation amount, and area of work performed.

e. Department Five-year Report: Following Approval of the Developer's five-year period final report, the Department will evaluate the data to determine, and issue a written report setting out its determination of, whether the Developer has (i) achieved the Renewal Work DBE Goal for the applicable period and (ii) if the goal has not been met, demonstrated that it has made good faith efforts to achieve the goal.

f. Uniform Report of DBE Awards or Commitments and Payments Form: By May 15 and November 15 of each year, the Developer shall submit to the Department for Acceptance a Uniform Report of DBE Awards or Commitments and Payments Form that has been completed in accordance with Appendix B of 49 CFR Part 26.

Part III. On-the-Job Training Goals and Requirements

1. On-the-Job Training (OJT) Goal

   a. The Department shall establish a Renewal Work OJT Goal for every Contract Year commencing with the Contract Year in which Substantial Completion occurs.

   b. The Department shall notify Developer of its Renewal Work OJT goal within 30 Calendar Days of the submission date of the Developer's Maintenance Management Plan for the applicable upcoming Contract Year and provide Developer with a reasonable opportunity to provide comments on such goal. Each goal will be set in accordance with the then-current CDOT OJT Special Standard Provision and based on the information contained in submittals required to be submitted by the Developer pursuant to Schedule 8 and Schedule 11.

2. Counting Goal Participation

   a. OJT participation that counts toward satisfying the applicable Renewal Work OJT Goal shall be calculated based on the aggregate number of employment hours on Renewal Work worked by trainees and apprentices who satisfy the requirements below.

   b. The employment of the following categories of individuals by the Developer (and Subcontractors) shall count towards achieving the applicable Renewal Work OJT Goal:

      i. Trainees that are enrolled with a program approved by the Department and FHWA; and/or

      ii. Apprentices that are enrolled and duly registered in a U.S. Department of Labor approved program.

   c. In addition, a proposed apprentice or trainee must have been Approved by the Department for such individual's participation to be counted toward achieving the applicable Renewal Work OJT Goal. Approval must occur before employment hours can be counted toward the goal. To obtain Approval for the apprentice or trainee, the Developer must submit the following to the Department for each apprentice and trainee:

      i. Evidence of the registration of the trainee or apprentice into the approved training program, and

      ii. The completed CDOT form for each trainee or apprentice.

   d. The employment of a trainee/apprentice in a skilled craft will not be counted toward the applicable Renewal Work OJT Goal if that individual has already worked or been paid at a professional/journey level status for more than 6 months prior to Approval of their participation as a trainee/apprentice.

   e. Before training begins, the Developer shall provide each trainee with a copy of the approved training program, pay scale, pension, and retirement benefits, health and disability benefits, promotional opportunities, other employer policies and compliant procedures.

3. Reporting Requirements

   a. Disclosure of Information: In order to monitor and enforce the requirements of this Schedule 15, the Developer shall disclose employment records for trainees and apprentices. The Department may verify employment records and information by reviewing personnel files as well as interviewing any individual employed by the Developer or any Subcontractor.

   b. Records: The Developer shall keep records regarding the progress on achieving the applicable Renewal Work OJT Goal, including Subcontractor participation.

c. Monthly Reports: In addition to the monthly reporting requirements contained in Section 13 of Schedule 11, the Developer shall, at the same time as complying with such requirements, submit a monthly report (in a form to be agreed between the Parties, both acting reasonably) to the Department for Acceptance during the Operating Period, which shall include the following information:

   i. Total Renewal Work employment hours expended during the applicable Contract Year to date separated into skilled craft employment hours and professional services employment hours.

   ii. Total employment hours for apprentices/trainees expended during the applicable Contract Year to date.

   iii. If the projected employment hours are less than the Renewal Work OJT Goal, the Developer shall provide an explanation detailing how it intends to achieve the then applicable Renewal Work OJT Goal, including a description of activities and other proactive measures intended to facilitate increased OJT participation.

   iv. A list of current and new (i.e. since the last report) trainees/apprentices by providing full name, employer, description of services or applicable work code, start date, skilled craft program registered in (including verification of enrollment) for trainees apprentices, total hours worked in current month, pay rate, total hours worked to date on the Project, supervisor full name, and a description of the training and performance level.

   v. Any performance problems with the trainee/apprentice and how the problems were resolved, including any reasons for participants leaving the Project.

   vi. A list of trainees/apprentices that have graduated or successfully completed their training program, and last date worked on site.

   vii. A signature by Developer certifying the information in the report is accurate.

d. Department Report: Following Acceptance of the final monthly report for the applicable Calendar Year, the Department will evaluate the data to determine, and issue a written report setting out its determination of, whether the Developer has achieved the Renewal Work OJT Goal for the applicable period.

Appendix D
Davis-Bacon Wage Decisions

The wage decisions provided in this Appendix D shall apply for the duration of the Construction Period. Those wage decisions are:

- Minimum Wages, Colorado, U.S. Department of Labor Decision **No. CO170016** dated June 9, 2017, which applies to Adams, Arapahoe, Broomfield, Clear Creek, Elbert, Gilpin, Jefferson, and Park counties.

- Minimum Wages, Colorado, U.S. Department of Labor Decision **No. CO170019** dated September 22, 2017, which applies Denver and Douglas counties.

Decision Nos. CO170016 dated January 06, 2017 supersedes **Decision Nos. CO160016** dated January 08, 2016.	**Modifications**			**ID**
	MOD Number	**Date**	**Page Number(s)**	
	1	**04-07-17**	**1**	**1**
When work within a project is located in two or more counties and the minimum wages and fringe benefits are different for one or more job classifications, the higher minimum wages and fringe benefits shall apply throughout the project.	**2**	**06-09-17**	**1**	**2**
General Decision No. CO170016 applies to the following counties: Adams, Arapahoe, Broomfield, Clear Creek, Elbert, Gilpin, Jefferson, and Park counties.				

General Decision No. CO170016

The wage and fringe benefits listed below reflect collectively bargained rates.

Code	Classification	Basic Hourly Rate	Fringe Benefits	Last Mod
	ELECTRICIAN (Traffic Signalization Only):			
1000	Clear Creek	29.60	10.77	**1**
	POWER EQUIPMENT OPERATOR:			
	Drill Rig Caisson			
1001	Smaller than Watson 2500 and similar	27.60	10.10	**2**
1002	Watson 2500 similar or larger	27.92	10.10	**2**
	Crane (50 tons and under)			
1003	Arapahoe, Broomfield, Clear Creek, Elbert, Gilpin	27.75	10.10	**2**
	Crane (51 - 90 tons)			
1004	Arapahoe, Broomfield, Clear Creek, Elbert, Gilpin	27.92	10.10	**2**
	Crane (91 - 140 tons)			
1005	Arapahoe, Broomfield, Clear Creek, Elbert, Gilpin	28.55	10.10	**2**
1006	**Scraper**			
1007	Single bowl under 40 cubic yards	27.75	10.10	**2**
1008	40 cubic yards and over	27.92	10.10	**2**

General Decision No. CO170016 **The wage and fringe benefits listed below do not reflect collectively bargained rates.**				
	CARPENTER:			
	Excludes Form Work			
1009	Adams	16.61	3.88	
1010	Arapahoe, Broomfield, Clear Creek, Elbert, Gilpin, Jefferson, Park	19.27	5.08	
	Form Work Only			
1011	Adams	16.78	3.57	
1012	Broomfield, Clear Creek, Elbert, Gilpin	19.11	5.46	
1013	Jefferson	16.88	3.81	
1014	Park	17.28	5.38	
	CEMENT MASON/CONCRETE FINISHER:			
1015	Adams	16.05	3.00	
1016	Arapahoe	18.70	3.85	
1017	Broomfield, Clear Creek, Elbert, Gilpin	18.37	3.00	
1018	Jefferson	18.02	3.42	
1019	Park	17.09	2.85	
	ELECTRICIAN:			
	Excludes Traffic Signal Installation			
1020	Adams	31.00	14.01	
1021	Arapahoe, Broomfield, Clear Creek, Elbert, Gilpin, Jefferson, Park	35.13	6.83	
	Traffic Signalization Electrician			
1022	Adams, Arapahoe, Broomfield, Clear Creek, Elbert, Gilpin, Park	27.25	7.10	
1023	Jefferson	26.78	5.44	
	Traffic Signalization Groundsman			
1024	Adams	13.96	2.80	
1025	Arapahoe, Broomfield, Elbert, Gilpin, Park	15.24	3.81	
1026	Clear Creek	15.70	2.14	
1027	Jefferson	15.19	4.72	

General Decision No. CO170016 **The wage and fringe benefits listed below do not reflect collectively bargained rates.**				
Code	**Classification**	**Basic Hourly Rate**	**Fringe Benefits**	**Last Mod**
1028	**FENCE ERECTOR**	13.02	3.20	
1029	**FORM WORKER** – Arapahoe	15.30	3.90	
	GUARDRAIL INSTALLER:			
1030	Adams	12.89	3.45	
1031	Arapahoe, Broomfield, Clear Creek, Elbert, Gilpin, Jefferson, Park	12.89	3.20	
	HIGHWAY/PARKING LOT STRIPING:			
	Painter			
1032	Adams, Arapahoe, Broomfield, Clear Creek, Elbert, Gilpin, Park	12.62	3.21	
1033	Jefferson	14.21	3.21	
	IRONWORKER:			
	Reinforcing			
1034	Adams	22.14	0.77	
1035	Arapahoe, Broomfield, Clear Creek, Elbert, Gilpin, Jefferson	16.69	5.45	
1036	Park	19.98	2.89	
1037	Structural	18.22	6.01	
	LABORER:			
	Asphalt Raker			
1038	Adams, Arapahoe, Broomfield, Clear Creek, Elbert, Gilpin, Jefferson	16.29	4.25	
1039	Park	17.41	1.86	
1040	Asphalt Shoveler	21.21	4.25	
1041	Asphalt Spreader	18.58	4.65	
	Common or General			
1042	Adams	16.29	4.25	
1043	Arapahoe, Broomfield, Clear Creek, Elbert, Gilpin	16.67	4.27	
1044	Jefferson	16.51	4.27	
1045	Park	15.64	2.46	

General Decision No. CO170016

The wage and fringe benefits listed below do not reflect collectively bargained rates.

Code	Classification	Basic Hourly Rate	Fringe Benefits	Last Mod
	Concrete Saw (Hand Held)			
1046	Adams	16.29	5.20	
1047	Arapahoe, Broomfield, Clear Creek, Elbert, Gilpin, Jefferson, Park	16.29	6.14	
	Landscape and Irrigation			
1048	Adams, Arapahoe, Broomfield, Elbert, Gilpin, Jefferson, Park	12.26	3.16	
1049	Clear Creek	14.98	3.16	
	Mason Tender - Cement/Concrete			
1050	Adams	17.71	2.83	
1051	Arapahoe, Broomfield, Clear Creek, Elbert, Gilpin	16.96	4.04	
1052	Jefferson	16.29	4.25	
1053	Park	15.08	3.10	
1054	Pipelayer	13.55	2.41	
	Traffic Control (Flagger)			
1055	Adams, Arapahoe, Broomfield, Clear Creek, Elbert, Gilpin	9.55	3.05	
1056	Jefferson	9.73	3.05	
1057	Park	9.42	3.21	
	Traffic Control (Sets Up/Moves Barrels, Cones, Install Signs, Arrow Boards and Place Stationary Flags)			
1058	Adams, Arapahoe, Broomfield, Elbert, Gilpin, Jefferson	12.43	3.22	
1059	Clear Creek	13.14	3.20	
1060	Park	12.76	3.20	
1061	**PAINTER (Spray Only)**	16.99	2.87	

General Decision No. CO170016 **The wage and fringe benefits listed below do not reflect collectively bargained rates.**				
Code	**Classification**	**Basic Hourly Rate**	**Fringe Benefits**	**Last Mod**
	POWER EQUIPMENT OPERATOR:			
	Asphalt Laydown			
1062	Adams, Arapahoe, Broomfield, Clear Creek, Elbert, Gilpin, Jefferson	22.67	8.75	
1063	Park	22.67	8.72	
1064	Asphalt Paver	24.97	6.13	
	Asphalt Roller			
1065	Adams	24.20	7.70	
1066	Arapahoe	22.68	8.72	
1067	Broomfield, Clear Creek, Elbert, Gilpin	23.41	7.67	
1068	Jefferson	22.84	7.69	
1069	Park	22.84	8.72	
	Asphalt Spreader			
1070	Adams, Arapahoe, Broomfield, Clear Creek, Elbert, Gilpin, Park	22.67	8.67	
1071	Jefferson	23.34	8.06	
1072	**Backhoe/Trackhoe**			
1073	Adams	20.31	4.24	
1074	Arapahoe	24.59	6.24	
1075	Broomfield, Clear Creek, Elbert, Gilpin	22.19	6.48	
1076	Jefferson	21.99	5.60	
1077	Park	20.81	6.58	

General Decision No. CO170016 **The wage and fringe benefits listed below do not reflect collectively bargained rates.**				
Code	**Classification**	**Basic Hourly Rate**	**Fringe Benefits**	**Last Mod**
	POWER EQUIPMENT OPERATOR (con't):			
	Bobcat/Skid Loader			
1078	Adams, Broomfield, Clear Creek, Elbert, Gilpin	15.37	4.28	
1079	Arapahoe	18.23	4.28	
1080	Jefferson	16.85	4.28	
1081	Park	22.46	0.00	
1082	Boom	22.67	8.72	
	Broom/Sweeper			
1083	Adams, Broomfield, Clear Creek, Elbert, Gilpin, Park	22.70	8.07	
1084	Arapahoe	22.67	8.73	
1085	Jefferson	22.18	8.36	
	Bulldozer			
1086	Adams	25.20	6.72	
1087	Arapahoe, Broomfield, Clear Creek, Elbert, Gilpin, Jefferson, Park	26.90	5.59	
1088	Concrete Pump	21.60	5.21	
	Crane			
1089	Adams, Park	22.82	8.72	
1090	Jefferson	23.55	6.68	
	Drill			
1091	Adams, Arapahoe, Broomfield, Clear Creek, Elbert, Gilpin, Park	20.48	4.71	
1092	Jefferson	20.65	5.74	
1093	Forklift	15.91	4.68	

General Decision No. CO170016

The wage and fringe benefits listed below do not reflect collectively bargained rates.

Code	Classification	Basic Hourly Rate	Fringe Benefits	Last Mod
	POWER EQUIPMENT OPERATOR (con't):			
	Grader/Blade			
1094	Adams	23.94	8.23	
1095	Arapahoe	22.67	8.72	
1096	Broomfield, Clear Creek, Elbert, Gilpin, Park	23.90	7.93	
1097	Jefferson	23.28	7.73	
1098	Guardrail/Post Driver	16.07	4.41	
	Loader (Front End)			
1099	Adams	23.09	8.72	
1100	Arapahoe	26.80	4.84	
1101	Broomfield, Clear Creek, Elbert, Gilpin	23.20	8.33	
1102	Jefferson	23.06	7.76	
1103	Park	22.67	8.72	
	Mechanic			
1104	Adams	22.82	8.72	
1105	Arapahoe, Broomfield, Clear Creek, Elbert, Gilpin, Park	24.04	7.35	
1106	Jefferson	23.56	8.72	
	Oiler			
1107	Adams, Jefferson	21.97	8.72	
1108	Arapahoe, Broomfield, Clear Creek, Elbert, Gilpin, Park	23.73	8.41	
	Roller/Compactor (Dirt and Grade Compaction)			
1109	Adams	16.70	3.30	
1110	Arapahoe, Broomfield, Clear Creek, Elbert, Gilpin, Jefferson	20.30	5.51	
1111	Park	16.52	3.13	
1112	Rotomill	16.22	4.41	

General Decision No. CO170016

The wage and fringe benefits listed below do not reflect collectively bargained rates.

Code	Classification	Basic Hourly Rate	Fringe Benefits	Last Mod
	POWER EQUIPMENT OPERATOR (con't):			
	Screed			
1113	Adams	27.89	3.50	
1114	Arapahoe	22.67	8.72	
1115	Broomfield, Clear Creek, Elbert, Gilpin	24.67	6.02	
1116	Jefferson	22.64	8.43	
1117	Park	20.36	3.04	
1118	Tractor	13.13	2.95	
	TRUCK DRIVER:			
	Distributor			
1119	Adams	15.80	5.27	
1120	Arapahoe	19.62	5.27	
1812	Broomfield, Clear Creek, Elbert, Gilpin, Park	18.19	5.27	
1121	Jefferson	19.46	6.04	
	Dump Truck			
1122	Adams	16.68	5.27	
1123	Arapahoe	18.94	5.27	
1124	Broomfield, Clear Creek, Elbert, Gilpin	16.47	5.27	
1125	Jefferson	16.97	4.78	
1126	Park	15.40	3.21	
	Lowboy Truck			
1127	Adams, Arapahoe, Broomfield, Clear Creek, Elbert, Gilpin, Park	17.25	5.27	
1128	Jefferson	19.80	6.42	
1129	Mechanic	26.48	3.50	
	Multi-Purpose Speciality and Hoisting Truck			
1130	Adams, Broomfield, Clear Creek, Elbert, Gilpin, Park	17.49	3.17	
1131	Arapahoe	15.79	2.48	
1132	Jefferson	15.13	3.89	

General Decision No. CO170016 **The wage and fringe benefits listed below do not reflect collectively bargained rates.**				
Code	**Classification**	**Basic Hourly Rate**	**Fringe Benefits**	**Last Mod**
	TRUCK DRIVER (con't.):			
	Semi/Trailer Truck (Includes Pickup and Pilot Car)			
1133	Adams, Broomfield, Clear Creek, Elbert, Gilpin, Jefferson,Park	18.39	4.13	
1134	Arapahoe	16.00	2.60	
	Single Axle (Includes Pickup and Pilot Car)			
1135	Adams, Jefferson	13.93	3.68	
1136	Arapahoe	15.10	3.77	
1137	Broomfield, Clear Creek, Elbert, Gilpin, Park	14.74	3.68	
1138	Truck Mounted Attenuator	12.43	3.22	
	Water Truck			
1139	Adams	17.50	5.19	
1140	Arapahoe, Broomfield, Clear Creek, Elbert, Gilpin, Park	19.36	4.07	
1141	Jefferson	17.57	5.27	

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29 CFR 5.5(a)(1)(ii)).

In the listing above, the "SU" designation means that rates listed under the identifier do not reflect collectively bargained wage and fringe benefit rates. Other designations indicate unions whose rates have been determined to be prevailing.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:
* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program.
If the response from this initial contact is not satisfactory, then the process described in
2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of
Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

END OF GENERAL DECISION NO. CO170016

	Modifications			ID
Decision Nos. CO170019 dated January 06, 2017 supersedes **Decision Nos. CO160019** dated January 08, 2016.	**MOD Number**	**Date**	**Page Number(s)**	
When work within a project is located in two or more counties and the minimum wages and fringe benefits are different for one or more job classifications, the higher minimum wages and fringe benefits shall apply throughout the project.	**1**	**01/27/17**	**1**	**1**
	2	**06/09/17**	**1 & 2**	**2**
	3	**09/22/17**	**1 & 2**	**3**
General Decision No. CO170019 applies to the following counties: Denver and Douglas counties.				

General Decision No. CO170019

The wage and fringe benefits listed below reflect collectively bargained rates.

Code	Classification	Basic Hourly Rate	Fringe Benefits	Last Mod
1279	**CARPENTER** (Form Work Only)	25.50	7.47	**1**
	TRAFFIC SIGNALIZATION:			
	Traffic Signal Installation			
1280	Zone 1	26.42	4.75% + 8.68	
1281	Zone 2	29.42	4.75% + 8.68	
	Traffic Installer Zone Definitions Zone 1 – Within a 35 mile radius measured from the addresses of the following cities: Colorado Springs - Nevada & Bijou Denver - Ellsworth Avenue & Broadway Ft. Collins - Prospect & College Grand Junction - 12th & North Avenue Pueblo - I-25 & Highway 50 Zone 2 - All work outside these areas.			
	POWER EQUIPMENT OPERATOR:			
	Hydraulic Backhoe			
1282	Wheel Mounted, under ¾ yds.	27.60	10.10	**3**
1283	Backhoe/Loader combination	27.60	10.10	**3**
	Drill Rig Caisson			
1284	Smaller than Watson 2500 and similar	27.60	10.10	**3**
1285	Watson 2500 similar or larger	27.92	10.10	**3**
	Loader			
1286	Up to and including 6 cubic yards	27.60	10.10	**3**
1287	Denver County - Under 6 cubic yards	27.60	10.10	**3**

General Decision No. CO170019 **The wage and fringe benefits listed below reflect collectively bargained rates.**				
Code	**Classification**	**Basic Hourly Rate**	**Fringe Benefits**	**Last Mod**
	POWER EQUIPMENT OPERATOR (con't.):			
1288	Denver County - Over 6 cubic yards	27.75	10.10	**3**
	Motor Grader			
1289	Douglas county - Blade Rough	27.60	10.10	**3**
1290	Douglas county - Blade Finish	27.92	10.10	**3**
	Crane			
1291	50 tons and under	27.75	10.10	**3**
1292	51 to 90 tons	27.92	10.10	**3**
1293	91 to 140 tons	28.55	10.10	**3**
	Scraper			
1294	Single bowl under 40 cubic yards	27.75	10.10	**3**
1295	40 cubic yards and over	27.92	10.10	**3**
General Decision No. CO170019 **The wage and fringe benefits listed below do not reflect collectively bargained rates.**				
1296	**CARPENTER (**Excludes Form Work)	19.27	5.08	
	CEMENT MASON/CONCRETE FINISHER:			
1297	Denver	20.18	5.75	
1298	Douglas	18.75	3.00	
1299	**ELECTRICIAN** (Excludes Traffic Signal Installation)	35.13	6.83	
1300	**FENCE ERECTOR** (Excludes Link/Cyclone Fence Erection)	13.02	3.20	
1301	**GUARDRAIL INSTALLER**	12.89	3.20	
	HIGHWAY/PARKING LOT STRIPING:			
	Painter			
1302	Denver	12.62	3.21	
1303	Douglas	13.89	3.21	
	IRONWORKERS:			
1304	**Reinforcing** (Excludes Guardrail Installation)	16.69	5.45	
1305	**Structural** (Includes Link/Cyclone Fence Erection), (Excludes Guardrail Installation)	18.22	6.01	

General Decision No. CO170019

The wage and fringe benefits listed below do not reflect collectively bargained rates.

Code	Classification	Basic Hourly Rate	Fringe Benefits	Last Mod
	LABORERS:			
1306	Asphalt Raker	16.29	4.25	
1307	Asphalt Shoveler	21.21	4.25	
1308	Asphalt Spreader	18.58	4.65	
	Common or General			
1309	Denver	16.76	6.77	
1310	Douglas	16.29	4.25	
1311	Concrete Saw (Hand Held)	16.29	6.14	
1312	Landscape and Irrigation	12.26	3.16	
	Mason Tender - Cement/Concrete			
1313	Denver	16.96	4.04	
1314	Douglas	16.29	4.25	
	Pipelayer			
1315	Denver	13.55	2.41	
1316	Douglas	16.30	2.18	
	Traffic Control			
1317	Flagger	9.55	3.05	
1318	Sets Up/Moves Barrels, Cones, Install Signs, Arrow Boards and Place Stationary Flags, (Excludes Flaggers)	12.43	3.22	
	PAINTER:			
1319	Spray Only	16.99	2.87	
	POWER EQUIPMENT OPERATOR:			
	Asphalt Laydown			
1320	Denver	22.67	8.72	
1321	Douglas	23.67	8.47	
	Asphalt Paver			
1322	Denver	24.97	6.13	
1323	Douglas	25.44	3.50	

General Decision No. CO170019 **The wage and fringe benefits listed below do not reflect collectively bargained rates.**				
Code	**Classification**	**Basic Hourly Rate**	**Fringe Benefits**	**Last Mod**
	POWER EQUIPMENT OPERATOR (con't.):			
	Asphalt Roller			
1324	Denver	23.13	7.55	
1325	Douglas	23.63	6.43	
1326	Asphalt Spreader	22.67	8.72	
	Backhoe/Trackhoe			
1327	Douglas	23.82	6.00	
1328	Bobcat/Skid Loader	15.37	4.28	
1329	Boom	22.67	8.72	
	Broom/Sweeper			
1330	Denver	22.47	8.72	
1331	Douglas	22.96	8.22	
1332	Bulldozer	26.90	5.59	
1333	Concrete Pump	21.60	5.21	
	Drill			
1334	Denver	20.48	4.71	
1335	Douglas	20.71	2.66	
1336	Forklift	15.91	4.68	
	Grader/Blade			
1337	Denver	22.67	8.72	
1338	Guardrail/Post Driver	16.07	4.41	
	Loader (Front End)			
1339	Douglas	21.67	8.22	
	Mechanic			
1340	Denver	22.89	8.72	
1341	Douglas	23.88	8.22	

General Decision No. CO170019

The wage and fringe benefits listed below do not reflect collectively bargained rates.

Code	Classification	Basic Hourly Rate	Fringe Benefits	Last Mod
	POWER EQUIPMENT OPERATOR (con't.):			
	Oiler			
1342	Denver	23.73	8.41	
1343	Douglas	24.90	7.67	
	Roller/Compactor (Dirt and Grade Compaction)			
1344	Denver	20.30	5.51	
1345	Douglas	22.78	4.86	
1346	Rotomill	16.22	4.41	
	Screed			
1347	Denver	22.67	8.38	
1348	Douglas	29.99	1.40	
1349	Tractor	13.13	2.95	
	TRAFFIC SIGNALIZATION:			
	Groundsman			
1350	Denver	17.90	3.41	
1351	Douglas	18.67	7.17	
	TRUCK DRIVER:			
	Distributor			
1352	Denver	17.81	5.82	
1353	Douglas	16.98	5.27	
	Dump Truck			
1354	Denver	15.27	5.27	
1355	Douglas	16.39	5.27	
1356	Lowboy Truck	17.25	5.27	
1357	Mechanic	26.48	3.50	
	Multi-Purpose Specialty & Hoisting Truck			
1358	Denver	17.49	3.17	
1359	Douglas	20.05	2.88	

General Decision No. CO170019 **The wage and fringe benefits listed below do not reflect collectively bargained rates.**				
Code	**Classification**	**Basic Hourly Rate**	**Fringe Benefits**	**Last Mod**
	TRUCK DRIVER (con't.):			
	Pickup and Pilot Car			
1360	Denver County	14.24	3.77	
1361	Douglas County	16.43	3.68	
1362	Semi/Trailer Truck	18.39	4.13	
1363	Truck Mounted Attenuator	12.43	3.22	
	Water Truck			
1364	Denver County	26.27	5.27	
1365	Douglas County	19.46	2.58	

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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END OF GENERAL DECISION NO. CO170019

Appendix E
Executive Order No. 11246

The following clauses from Executive Order No. 11246 shall be included in all Subcontracts without modification except as appropriate to identify the Subcontractor who will be subject to its provisions in place of "Developer":

1. Developer will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. Developer will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. Developer agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the contracting officer setting forth the provisions of this nondiscrimination clause.

2. Developer will, in all solicitations or advancements for employees placed by or on behalf of Developer, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.

3. Developer will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with Developer's legal duty to furnish information.

4. Developer will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the agency contracting officer, advising the labor union or workers' representative of Developer's commitments under Section 202 of Executive Order No. 11246 of September 24, 1965, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

5. Developer will comply with all provisions of Executive Order No. 11246 of Sept. 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

6. Developer will furnish all information and reports required by Executive Order No. 11246 of September 24, 1965, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

7. In the event of Developer's noncompliance with the nondiscrimination clauses of this contract or with any of such rules, regulations, or orders, this contract may be cancelled, terminated, or suspended in whole or in part and Developer may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order No. 11246 of Sept. 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order No. 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

8. Developer will include the provisions of Sections 1 to 8 of this Appendix E in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued

pursuant to Section 204 of Executive Order No. 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. Developer will take such action with respect to any subcontract or purchase order as may be directed by the Secretary of Labor as a means of enforcing such provisions including sanctions for noncompliance: Provided, however, that in the event Developer becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction, Developer may request the United States to enter into such litigation to protect the interests of the United States."

Appendix F
CDOT's Special Standard Provision for
"Affirmative Action Requirements Equal Employment Opportunity"

A. AFFIRMATIVE ACTION REQUIREMENTS

Notice of Requirement for Affirmative Action to Ensure Equal Employment Opportunity (Executive Order 11246)

i. The Developer acknowledges the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Opportunity Construction Contract Specifications" set out in this Appendix F.

ii. The goals and timetables for minority and female participation, expressed in percentage terms for the Developer's aggregate workforce in each trade on all construction work in the covered area are as follows:

Goals and Timetable for Minority Utilization

TIMETABLE - UNTIL FURTHER NOTICE			
Economic Area	**Standard Metropolitan Statistical Area (SMSA)**	**Counties Involved**	**Goal**
157 (Denver)	2080 Denver-Boulder	Adams, Arapahoe, Boulder, Denver, Douglas, Gilpin, Jefferson.....	13.8%
GOALS AND TIMETABLES FOR FEMALE UTILIZATION			
Until Further Notice.....6.9% -- Statewide			

These goals are applicable to all the Developer's Construction Work performed in the covered area. If the Developer performs Construction Work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the Developer also is subject to the goals for both its Federally involved and non-Federally involved construction.

The Developer's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals established for the geographical area where the contract resulting from this solicitation is to be performed. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the Developer shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Developer's goals shall be a violation of the contract, the Executive Order and the regulations in 41 CFR Par 60-4. Compliance with the goals will be measured against the total work hours performed.

iii. The Developer shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 Working Days of award of any construction subcontract in excess of at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address and telephone number of the subcontractor; employer identification number; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the contract is to be performed.

iv. As used in this specification, and in the contract resulting from this solicitation, the "covered area" is the county or counties shown on the Invitation for Bids and on the

plans. In cases where the work is in two or more counties covered by differing percentage goals, the highest percentage will govern.

B. STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION CONTRACT SPECIFICATIONS

i. Standard Federal Equal Employment Opportunity Construction Contract Specifications (Executive Order 11246) As used in these Specifications:

A. "Covered area" means the geographical area described in the solicitation from which this contract resulted;

B. "Director" means Director, Office of Federal Contract Compliance Programs, United States Department of Labor, or any person to whom the Director delegates authority;

C. "Employer identification number" means the Federal Social Security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941.

D. "Minority" includes;

1. Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);

2. Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish Culture or origin, regardless of race);

3. Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and

4. American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

ii. Whenever the Developer, or any Subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.

iii. If the Developer is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. The Developer must be able to demonstrate its participation in and compliance with the provisions of any such Hometown Plan. If the Developer is participating in an approved Plan it is required to comply with its obligations under the EEO clause, and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other contractors toward a goal in an approved Plan does not excuse any covered contractor's failure to take good faith efforts to achieve the Plan goals and timetables.

iv. The Developer shall implement the specific affirmative action standards provided in paragraphs vii A through P of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Developer should reasonably be able to achieve in each construction trade in which it has employees in the covered area. Covered construction contractors performing construction work in geographical areas where they do not have a Federal or Federally assisted construction

contract shall apply the minority and female goals established for the geographical area where the work is being performed. Goals are published periodically in the Federal Register in notice form, and such notices may be obtained from any office of Federal Contract Compliance Programs Office or from Federal procurement contracting officers. The Developer is expected to make substantially uniform progress in meeting its goals in each craft during the period specified.

v. Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Developer has a collective bargaining agreement, to refer either minorities or women shall excuse the Developer's obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant thereto.

vi. In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the Developer during the training period, and the Developer must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.

vii. The Developer shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Developer's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Developer shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following;

A. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the Developer's employees are assigned to work. The Developer shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the Developer's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.

B. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Developer or its union have employment opportunities available, and maintain a record of the organization's responses.

C. Maintain a current file of the names, addresses and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source of community organization and of what action was taken with respect to each individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Developer by the union or, if referred, not employed by the Developer, this shall be documented in the file with the reason therefor, along with whatever additional actions the Developer may have taken.

D. Provide immediate written notification to the Director when the union with which the Developer has a collective bargaining agreement has not referred to the Developer a minority person or woman sent by the Developer, or when he the Developer has other information that the union referral process has impeded the Developer's efforts to meet its obligations.

E. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Developer's employment needs, especially those programs funded or approved by the Department of Labor. The Developer shall provide notice of these programs to the sources compiled under paragraph vii.B of these specifications.

F. Disseminate the Developer's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Developer in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc., by specific review of the policy with all management personnel and with all minority and female employees at least once a year, and by posting the Developer's EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

G. Review, at least annually, the Developer's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination or other employment decisions including specific review of these items with onsite supervisory personnel such as Superintendents, General Foreman, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

H. Disseminate the Developer's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the Contractors and Subcontractors with whom the Developer does or anticipates doing business.

I. Direct its recruitment efforts, both oral and written, to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the Developer's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the Developer shall send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

J. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of a the Developer's workforce.

K. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.

L. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc. such opportunities.

M. Ensure that seniority practices, job classifications, work assignments and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the Developer's obligations under these specifications are being carried out.

N. Ensure that all facilities and the Developer's activities are non-segregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.

O. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

P. Conduct a review, at least annually, of all supervisor's adherence to and performance under the Developer's EEO policies and affirmative action obligation.

viii. Contractors (including the Developer) are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations (paragraphs vii.A through P). The efforts of a contractor association, joint contractor-union contractor-community, or other similar group of which the Developer is a member and participant, may be asserted as fulfilling any one or more of its obligations under paragraphs vii.A through P of these specifications provided that the Developer actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Developer's minority and female workforce participation, makes a good faith effort to meet its individual goal and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Developer. The obligation to comply, however, is the Developer's and failure of such a group to fulfil an obligation shall not be a defense for the Developer's noncompliance.

ix. A single goal for minorities and a separate single goal for women have been established. The Developer, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the Developer may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even though the Developer has achieved its goals for women generally, the Developer may be in violation of the Executive Order if a specific minority group of women is underutilized).

x. The Developer shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, sexual orientation, gender identity, national origin, or disability.

xi. The Developer shall not enter into any Subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.

xii. The Developer shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. If the Developer fails to carry out such sanctions and penalties it shall be in violation of these specifications and Executive Order 11246, as amended.

xiii. The Developer, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph vii of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Developer fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.

xiv. The Developer shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government and to keep records. Records shall at least include for each employee the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.

xv. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

C. SPECIFIC EQUAL EMPLOYMENT OPPORTUNITY RESPONSIBILITIES.

i. *General*.

A. Equal employment opportunity requirements not to discriminate and to take affirmative action to assure equal employment opportunity as required by Executive Order 11246 and Executive Order 11375 are set forth in Required Contract. Provisions (Form FHWA 1273 or 1316, as appropriate) and these Special Provisions which are imposed pursuant to Section 140 of Title 23, U.S.C., as established by Section 22 of the Federal-Aid highway Act of 1968. The requirements set forth in these Special Provisions shall constitute the specific affirmative action requirements for project activities under this contract and supplement the equal employment opportunity requirements set forth in the Required Contract Provisions.

B. The Developer will work with the Department and the Federal Government in carrying out equal employment opportunity obligations and in their review of his/her activities under the contract.

C. The Developer and all his/her Subcontractors holding subcontracts not including material suppliers, of or more, will comply with the following minimum specific requirement activities of equal employment opportunity: (The equal employment opportunity requirements of Executive Order 11246, as set forth in Volume 6, Chapter 4, Section 1, SubSection 1 of the Federal-Aid Highway Program Manual, are applicable to material suppliers as well as contractors and subcontractors.) The Developer will include these requirements in every subcontract of or more with such modification of language as is necessary to make them binding on the Subcontractor.

ii. *Equal Employment Opportunity Policy*. The Developer will accept as its operating policy the following statement which is designed to further the provision of equal employment opportunity to all persons without regard to their race, color, religion, sex, sexual orientation, gender identity, national origin, or disability, and to promote the full realization of equal employment opportunity through a positive continuing program;

It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, sexual orientation, gender identity, national origin, or disability. Such action shall include; employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, pre-apprenticeship, and/or on-the-job training.

iii. *Equal Employment Opportunity Officer*. The Developer will designate and make known to the State highway agency contracting officers and equal employment opportunity officer (herein after referred to as the EEO Officer) who will have the responsibility for and must be capable of effectively administering and promoting an active contractor program of equal employment opportunity and who must be assigned adequate authority and responsibility to do so.

iv. *Dissemination of Policy*.

A. All members of the Developer's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the Developer's equal employment opportunity policy and contractual

responsibilities to provide equal employment opportunity in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum.

B. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the Developer's equal employment opportunity policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer or other knowledgeable company official.

C. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer or other knowledgeable company official, covering all major aspects of the Developer's equal employment opportunity obligations within thirty days following their reporting for duty with the Developer.

D. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer or appropriate company official in the Developer's procedures for locating and hiring minority group employees.

1. In order to make the Developer's equal employment opportunity policy known to all employees, prospective employees and potential sources of employees, i.e., schools, employment agencies, labor unions (where appropriate), college placement officers, etc., the Developer will take the following actions:

a. Notices and posters setting forth the Developer's equal employment opportunity policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.

b. The Developer's equal employment opportunity policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.

v. *Recruitment*.

A. When advertising for employees, the Developer will include in all advertisements for employees the notation; "An Equal Opportunity Employer." All such advertisements will be published in newspapers or other publications having a large circulation among minority groups in the area from which the project work force would normally be derived.

B. The Developer will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minority group applicants, including, but not limited to, State employment agencies, schools, colleges and minority group organizations. To meet this requirement, The Developer will, through his EEO Officer, identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority group applicants may be referred to The Developer for employment consideration.

In the event the Developer has a valid bargaining agreement providing for exclusive hiring hall referrals, he is expected to observe the provisions of that agreement to the extent that the system permits the Developer's compliance with equal employment opportunity contract provisions. (The U.S. Department of Labor has held that where implementation of such agreements has the effect of discriminating against minorities or women, or obligates The Developer to do the same, such implementation violates Executive Order 11246, as amended.)

C. The Developer will encourage his present employees to refer minority group applicants for employment by posting appropriate notices or bulletins in areas accessible to all such employees. In addition, information and procedures with regard to referring minority group applicants will be discussed with employees.

vi. *Personnel Actions*. Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, sexual orientation, gender identity, national origin, or disability. The following procedures shall be followed;

A. The Developer will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.

B. The Developer will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.

C. The Developer will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the Developer will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.

D. The Developer will promptly investigate all complaints of alleged discrimination made to the Developer in connection with his obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the Developer will inform every complainant of all of his avenues of appeal.

vii. *Training and Promotion*.

A. The Developer will assist in locating, qualifying, and increasing the skills of minority group and women employees, and applicants for employment.

B. Consistent with the Developer's work force requirements and as permissible under Federal and State regulations, the Developer shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training.

C. The Developer will advise employees and applicants for employment of available training programs and entrance requirements for each.

D. The Developer will periodically review the training and promotion potential of minority group and women employees and will encourage eligible employees to apply for such training and promotion.

viii. *Unions*. If the Developer relies in whole or in part upon unions as a source of employees, the Developer will use his/her best efforts to obtain the cooperation of such unions to increase opportunities for minority groups and women with the unions, and to effect referrals by such unions of minority and female employees. Actions by the Developer either directly or through a contractor's association acting as agent will include the procedures set forth below:

A. The Developer will use best efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minority group members and women for membership in the unions and increasing the skills of minority

group employees and women so that they may qualify for higher paying employment.

B. The Developer will use best efforts to incorporate an equal employment opportunity clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, sexual orientation, gender identity, national origin, or disability.

C. The Developer is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the Developer, the Developer shall so certify to the State highway department and shall set forth what efforts have been made to obtain such information.

D. In the event the union is unable to provide the Developer with a reasonable flow of minority and women referrals within he time limit set forth in the collective bargaining agreement, the Developer will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, sexual orientation, gender identity, national origin, or disability; making full efforts to obtain qualified and/or qualifiable minority group persons and women. (The U.S. Department of Labor has held that it shall be no excuse that the union with which the Developer has a collective bargaining agreement providing for exclusive referral failed to refer minority employees.) In the event the union referral practice prevents the Developer from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such the Developer shall immediately notify the State highway agency.

ix. *Subcontracting*.

A. The Developer will use his best efforts to solicit bids from and to utilize minority group Subcontractors or Subcontractors with meaningful minority group and female representation among their employees. The Developer shall obtain lists of minority-owned construction firms from State highway agency personnel.

B. The Developer will use his best efforts to ensure Subcontractor compliance with their equal employment opportunity obligations.

x. *Records and Reports*.

A. The Developer will keep such records as are necessary to determine compliance with the Developer's equal employment opportunity obligations. The records kept by the Developer will be designed to indicate:

1. The number of minority and nonminority group members and women employed in each work classification on the project.

2. The Progress and efforts being made in cooperation with unions to increase employment opportunities for minorities and women (applicable only to contractors who rely in whole or in part on unions as a source of their work force).

3. The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minority and female employees, and

4. The progress and efforts being made in securing the services of minority group Subcontractors or Subcontractors with meaningful minority and female representation among their employees.

B. All such records must be retained for a period of three years following completion of the contract work and shall be available at reasonable times and places for

inspection by authorized representatives of the State highway agency and the Federal Highway Administration.

The Developer will submit an annual report to the State highway agency each July for the duration of the project, indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on Form PR 1391.

Appendix G
USDOT Order No. 1050.2A "USDOT Standard Title VI/Non-Discrimination Assurances"

Part I – All Contracts

During the performance of this Agreement, the Developer, for itself, its assignees, and successors in interest agrees as follows:

1. Compliance with Law: the Developer (hereinafter includes consultants) will comply with all Law relative to Non-discrimination in Federally-assisted programs of the U.S. Department of Transportation, Federal Highway Administration (as they may be amended from time to time, "Non-discrimination Law") which are herein incorporated by reference and made a part of this Agreement.

2. Non-discrimination: the Developer will not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The Developer will not participate directly or indirectly in the discrimination prohibited by Non-discrimination Law, including employment practices when the relevant contract covers any activity, project, or program set forth in Appendix B of 49 CFR Part 21.

3. Solicitations for Subcontracts, Including Procurements of Materials and Equipment: in all solicitations, either by competitive bidding, or negotiation made by the Developer for work to be performed under a Subcontract, including procurements of materials, or leases of equipment, each potential Subcontractor will be notified by the Developer of the Developer's obligations under this Agreement and Non-discrimination Law.

4. Information and Reports: the Developer will provide all information and reports required by Non-discrimination Law, and directives issued pursuant thereto, and will permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Department or FHWA to be pertinent to ascertain compliance with Non-discrimination Law and any such directives. Where any information required of the Developer is in the exclusive possession of another who fails or refuses to furnish the information, the Developer will so certify to the Department or FHWA, as appropriate, and will set forth what efforts it has made to obtain the information.

5. Sanctions for Noncompliance: in the event of the Developer's noncompliance with the nondiscrimination provisions in this Agreement, the Department will impose such contract sanctions as it or FHWA may determine to be appropriate, including, but not limited to: withholding payments to the Developer under this Agreement until the Developer complies; and/or cancelling, terminating, or suspending a contract, in whole or in part.

6. Incorporation of Provisions: the Developer will include the provisions of Sections 1 through 6 of this Part I in every Subcontract, including procurements of materials and leases of equipment, unless exempt by Non-discrimination Law and directives issued pursuant thereto. The Developer will take action with respect to any subcontract or procurement as the Department or FHWA may direct as a means of enforcing such provisions including sanctions for noncompliance, provided that, if the Developer becomes involved in, or is threatened with, litigation by a Subcontractor because of such direction, the Developer may request the Department to enter into any litigation to protect the interests of the Department and the Enterprises. In addition, the Developer may request the United States to enter into the litigation to protect the interests of the United States.

Part II – Clauses for Transfer of Real Property Acquired or Improved under the Activity, Facility, or Program

The Developer for himself/herself, his/her heirs, personal representatives, successors in interest, and assigns, as a part of the consideration hereof, does hereby covenant and agree that, in the event facilities are constructed, maintained, or otherwise operated on the property subject to the Project License for a purpose for which a US DOT activity, facility, or program is extended or for another purpose involving the provision of similar services or benefits, the licensee will maintain and operate such facilities and services in compliance with all requirements imposed by Non-

discrimination Law such that no person on the grounds of race, color, or national origin will be excluded from participation in, denied the benefits of, or be otherwise subjected to discrimination in the use of said facilities.

Part III – Clauses for Construction/Use/Access to Real Property Acquired under the Activity, Facility or Program

The licensee for himself/herself, his/her heirs, personal representatives, successors in interest, and assigns, as a part of the consideration hereof, does hereby covenant that (1) no person on the ground of race, color, or national origin, will be excluded from participation in, denied the benefits of, or be otherwise subjected to discrimination in the use of said facilities, (2) in the construction of any improvements on, over, or under such land, and the furnishing of services thereon, no person on the ground of race, color, or national origin, will be excluded from participation in, denied the benefits of, or otherwise be subjected to discrimination, and (3) the licensee will use the premises in compliance with all other requirements imposed by or pursuant to Non-discrimination Law.

Parts IV – Non-Discrimination Authorities

Without prejudice to the generality of any other nondiscrimination provisions in this Agreement, during the performance of this Agreement, the Developer, for itself, its assignees, and successors in interest agrees to comply with the following Non-discrimination Law (as any such Law is amended from time to time):

Title VI of the Civil Rights Act of 1964 (42 U.S.C. § 2000d et seq., 78 stat. 252), (prohibits discrimination on the basis of race, color, national origin); and 49 CFR Part 21;

The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (42 U.S.C. § 4601), (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-aid programs and projects);

Federal-Aid Highway Act of 1973, (23 U.S.C. § 324 et seq.), (prohibits discrimination on the basis of sex);

Section 504 of the Rehabilitation Act of 1973, (29 U.S.C. § 794 et seq.), as amended, (prohibits discrimination on the basis of disability); and 49 CFR Part 27;

The Age Discrimination Act of 1975, (42 U.S.C. § 6101 et seq.), as amended, (prohibits discrimination on the basis of age);

Airport and Airway Improvement Act of 1982, (49 USC § 471, Section 47123), as amended, (prohibits discrimination based on race, creed, color, national origin, or sex);

The Civil Rights Restoration Act of 1987, (PL 100-209), (Broadened the scope, coverage and applicability of Title VI of the Civil Rights Act of 1964, The Age Discrimination Act of 1975 and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of the terms “programs or activities” to include all of the programs or activities of the Federal-aid recipients, sub-recipients and contractors, whether such programs or activities are Federally funded or not);

Titles II and III of the Americans with Disabilities Act, (42 U.S.C. §§ 12131-12189), (prohibits discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities), as implemented by US DOT regulations at 49 C.F.R. parts 37 and 38;

The Federal Aviation Administration’s Non-discrimination statute, (49 U.S.C. § 47123), (prohibits discrimination on the basis of race, color, national origin, and sex);

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations(ensures non-discrimination against minority populations by discouraging programs, policies, and activities with disproportionately high and adverse human health or environmental effects on minority and low-income populations);

Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of Limited English proficiency (LEP). To ensure compliance with Title VI, you must take reasonable steps to ensure that LEP persons have meaningful access to your programs (70 Fed. Reg. at 74087 to 74100);

Title IX of the Education Amendments of 1972, as amended, (20 U.S.C. 1681 et seq.), (prohibits discrimination because of sex in education programs or activities).

Appendix H
Required Contract Provisions

Federal-Aid Construction Contracts

I. General
II. Nondiscrimination
III. Nonsegregated Facilities
IV. Davis-Bacon and Related Act Provisions
V. Contract Work Hours and Safety Standards Act Provisions
VI. Subletting or Assigning the Contract
VII. Safety: Accident Prevention
VIII. False Statements Concerning Highway Projects
IX. Implementation of Clean Air Act and Federal Water Pollution Control Act
X. Compliance with Governmentwide Suspension and Debarment Requirements
XI. Certification Regarding Use of Contract Funds for Lobbying

I. GENERAL

1. Form FHWA-1273 must be physically incorporated in each construction contract funded under Title 23 (excluding emergency contracts solely intended for debris removal). The contractor (or subcontractor) must insert this form in each subcontract and further require its inclusion in all lower tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services).

   The applicable requirements of Form FHWA-1273 are incorporated by reference for work done under any purchase order, rental agreement or agreement for other services. The prime contractor shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

   Form FHWA-1273 must be included in all Federal-aid design-build contracts, in all subcontracts and in lower tier subcontracts (excluding subcontracts for design services, purchase orders, rental agreements and other agreements for supplies or services). The design-builder shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

   Contracting agencies may reference Form FHWA-1273 in bid proposal or request for proposal documents, however, the Form FHWA-1273 must be physically incorporated (not referenced) in all contracts, subcontracts and lower-tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services related to a construction contract).

2. Subject to the applicability criteria noted in the following sections, these contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract.

3. A breach of any of the stipulations contained in these Required Contract Provisions may be sufficient grounds for withholding of progress payments, withholding of final payment, termination of the contract, suspension / debarment or any other action determined to be appropriate by the contracting agency and FHWA.

4. Selection of Labor: During the performance of this contract, the contractor shall not use convict labor for any purpose within the limits of a construction project on a Federal-aid highway unless it is labor performed by convicts who are on parole, supervised release, or probation. The term Federal-aid highway does not include roadways functionally classified as local roads or rural minor collectors.

II. NONDISCRIMINATION

The provisions of this Section related to 23 CFR Part 230 are applicable to all Federal-aid construction contracts and to all related construction subcontracts of or more. The provisions of 23 CFR Part 230 are not applicable to material supply, engineering, or architectural service contracts.

In addition, the contractor and all subcontractors must comply with the following policies: Executive Order 11246, 41 CFR 60, 29 CFR 1625-1627, Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The contractor and all subcontractors must comply with: the requirements of the Equal Opportunity Clause in 41 CFR 60-1.4(b) and, for all construction contracts exceeding , the Standard Federal Equal Employment Opportunity Construction Contract Specifications in 41 CFR 60-4.3.

Note: The U.S. Department of Labor has exclusive authority to determine compliance with Executive Order 11246 and the policies of the Secretary of Labor including 41 CFR 60, and 29 CFR 1625-1627. The contracting agency and the FHWA have the authority and the responsibility to ensure compliance with Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), and Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The following provision is adopted from 23 CFR 230, Appendix A, with appropriate revisions to conform to the U.S. Department of Labor (US DOL) and FHWA requirements.

1. **Equal Employment Opportunity:** Equal employment opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (28 CFR 35, 29 CFR 1630, 29 CFR 1625-1627, 41 CFR 60 and 49 CFR 27) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140 shall constitute the EEO and specific affirmative action standards for the contractor's project activities under this contract. The provisions of the Americans with Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR 35 and 29 CFR 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:

    a. The contractor will work with the contracting agency and the Federal Government to ensure that it has made every good faith effort to provide equal opportunity with respect to all of its terms and conditions of employment and in their review of activities under the contract.

    b. The contractor will accept as its operating policy the following statement:

    "It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, pre-apprenticeship, and/or on-the-job training."

2. **EEO Officer:** The contractor will designate and make known to the contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active EEO program and who must be assigned adequate authority and responsibility to do so.

3. **Dissemination of Policy:** All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and

classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:

a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer.

b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.

c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minorities and women.

d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.

e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.

4. **Recruitment:** When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minorities and women in the area from which the project work force would normally be derived.

a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minorities and women. To meet this requirement, the contractor will identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority and women applicants may be referred to the contractor for employment consideration.

b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, the contractor is expected to observe the provisions of that agreement to the extent that the system meets the contractor's compliance with EEO contract provisions. Where implementation of such an agreement has the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Federal nondiscrimination provisions.

c. The contractor will encourage its present employees to refer minorities and women as applicants for employment. Information and procedures with regard to referring such applicants will be discussed with employees.

5. **Personnel Actions:** Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, national origin, age or disability. The following procedures shall be followed:

a. The contractor will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.

b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.

c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.

d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with its obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of their avenues of appeal.

6. Training and Promotion:

a. The contractor will assist in locating, qualifying, and increasing the skills of minorities and women who are applicants for employment or current employees. Such efforts should be aimed at developing full journey level status employees in the type of trade or job classification involved.

b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision. The contracting agency may reserve training positions for persons who receive welfare assistance in accordance with 23 U.S.C. 140(a).

c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.

d. The contractor will periodically review the training and promotion potential of employees who are minorities and women and will encourage eligible employees to apply for such training and promotion.

7. Unions: If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use good faith efforts to obtain the cooperation of such unions to increase opportunities for minorities and women. Actions by the contractor, either directly or through a contractor's association acting as agent, will include the procedures set forth below:

a. The contractor will use good faith efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minorities and women for membership in the unions and increasing the skills of minorities and women so that they may qualify for higher paying employment.

b. The contractor will use good faith efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, national origin, age or disability.

c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the contracting agency and shall set forth what efforts have been made to obtain such information.

d. In the event the union is unable to provide the contractor with a reasonable flow of referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, national origin, age or disability; making full efforts to obtain qualified and/or qualifiable minorities and women. The failure of a union to provide sufficient referrals (even though it is obligated to provide exclusive referrals under the terms of a collective bargaining agreement) does not relieve the contractor from the requirements of this paragraph. In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the contracting agency.

8. **Reasonable Accommodation for Applicants / Employees with Disabilities:** The contractor must be familiar with the requirements for and comply with the Americans with Disabilities Act and all rules and regulations established thereunder. Employers must provide reasonable accommodation in all employment activities unless to do so would cause an undue hardship.

9. **Selection of Subcontractors, Procurement of Materials and Leasing of Equipment:** The contractor shall not discriminate **on** the grounds of race, color, religion, sex, national origin, age or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment. The contractor shall take all necessary and reasonable steps to ensure nondiscrimination in the administration of this contract.

   a. The contractor shall notify all potential subcontractors and suppliers and lessors of their EEO obligations under this contract.

   b. The contractor will use good faith efforts to ensure subcontractor compliance with their EEO obligations.

10. **Assurance Required by 49 CFR 26.13(b):**

   a. The requirements of 49 CFR Part 26 and the State DOT's U.S. DOT-approved DBE program are incorporated by reference.

   b. The contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the contracting agency deems appropriate.

11. **Records and Reports:** The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following the date of the final payment to the contractor for all contract work and shall be available at reasonable times and places for inspection by authorized representatives of the contracting agency and the FHWA.

   a. The records kept by the contractor shall document the following:

      (1) The number and work hours of minority and non-minority group members and women employed in each work classification on the project;

      (2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women; and

      (3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minorities and women;

   b. The contractors and subcontractors will submit an annual report to the contracting agency each July for the duration of the project, indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on Form FHWA-1391. The staffing data should represent the project work force on board in all or any part of the last payroll period preceding the end of July. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data. The employment data should reflect the work force on board during all or any part of the last payroll period preceding the end of July.

III. NONSEGREGATED FACILITIES

This provision is applicable to all Federal-aid construction contracts and to all related construction subcontracts of or more.

The contractor must ensure that facilities provided for employees are provided in such a manner that segregation on the basis of race, color, religion, sex, or national origin cannot result. The contractor may neither require such segregated use by written or oral policies nor tolerate such use by employee custom. The contractor's obligation extends further to ensure that its employees are not assigned to perform their services at any location, under the contractor's control, where the facilities are segregated. The term "facilities" includes waiting rooms, work areas, restaurants and other eating areas, time clocks, restrooms, washrooms, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing provided for employees. The contractor shall provide separate or single-user restrooms and necessary dressing or sleeping areas to assure privacy between sexes.

IV. DAVIS-BACON AND RELATED ACT PROVISIONS

This Section is applicable to all Federal-aid construction projects exceeding and to all related subcontracts and lower-tier subcontracts (regardless of subcontract size). The requirements apply to all projects located within the right-of-way of a roadway that is functionally classified as Federal-aid highway. This excludes roadways functionally classified as local roads or rural minor collectors, which are exempt. Contracting agencies may elect to apply these requirements to other projects.

The following provisions are from the U.S. Department of Labor regulations in 29 CFR 5.5 “Contract provisions and related matters” with minor revisions to conform to the FHWA-1273 format and FHWA program requirements.

1. Minimum wages

a. All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

b. Contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph 1.d. of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph 1.b. of this section) and the Davis-Bacon poster (WH–1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(1) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification

and wage rate and fringe benefits therefore only when the following criteria have been met:

i. The work to be performed by the classification requested is not performed by a classification in the wage determination; and

ii. The classification is utilized in the area by the construction industry; and

iii. The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(2) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(3) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. The Wage and Hour Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(4) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs 1.b.(2) or 1.b.(3) of this Section 1.b., shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

c. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

d. If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

2. Withholding

The contracting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract, or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be

considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the contracting agency may, after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

3. Payrolls and basic records

a. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in Section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(1) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the contracting agency. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH–347 is available for this purpose from the Wage and Hour Division Website at http://www.dol.gov/esa/whd/forms/wh347instr.htm or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the contracting agency for transmission to the State DOT, the FHWA or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this Section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the contracting agency.

(2) Each payroll submitted shall be accompanied by a “Statement of Compliance,” signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

i. That the payroll for the payroll period contains the information required to be provided under §5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under §5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

ii. That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

iii. That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(3) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH–347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 3.a.(2) of this section.

(4) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under Section 1001 of title 18 and Section 231 of title 31 of the United States Code.

b. The contractor or subcontractor shall make the records required under paragraph 3.a. of this Section available for inspection, copying, or transcription by authorized representatives of the contracting agency, the State DOT, the FHWA, or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the FHWA may, after written notice to the contractor, the contracting agency or the State DOT, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4. Apprentices and trainees

a. Apprentices (programs of the USDOL).

Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice.

The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the

ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.

In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

b. Trainees (programs of the USDOL).

Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration.

The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration.

Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.

In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

c. Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

d. Apprentices and Trainees (programs of the U.S. DOT).

Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.

5. Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

6. Subcontracts. The contractor or subcontractor shall insert Form FHWA-1273 in any subcontracts and also require the subcontractors to include Form FHWA-1273 in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

7. Contract termination: debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

9. Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. Certification of eligibility.

a. By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

b. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

c. The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

V. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

The following clauses apply to any Federal-aid construction contract in an amount in excess of
and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by 29 CFR 5.5(a) or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

1. Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives

compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

2. **Violation; liability for unpaid wages; liquidated damages.** In the event of any violation of the clause set forth in paragraph (1.) of this section, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1.) of this section, in the sum of for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1.) of this section.

3. **Withholding for unpaid wages and liquidated damages.** The FHWA or the contacting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2.) of this section.

4. **Subcontracts.** The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (1.) through (4.) of this Section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1.) through (4.) of this section.

VI. SUBLETTING OR ASSIGNING THE CONTRACT

This provision is applicable to all Federal-aid construction contracts on the National Highway System.

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the contracting agency. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635.116).

   a. The term “perform work with its own organization” refers to workers employed or leased by the prime contractor, and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor or lower tier subcontractor, agents of the prime contractor, or any other assignees. The term may include payments for the costs of hiring leased employees from an employee leasing firm meeting all relevant Federal and State regulatory requirements. Leased employees may only be included in this term if the prime contractor meets all of the following conditions:

      (1) the prime contractor maintains control over the supervision of the day-to-day activities of the leased employees;

      (2) the prime contractor remains responsible for the quality of the work of the leased employees;

      (3) the prime contractor retains all power to accept or exclude individual employees from work on the project; and

(4) the prime contractor remains ultimately responsible for the payment of predetermined minimum wages, the submission of payrolls, statements of compliance and all other Federal regulatory requirements.

b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid or propose on the contract as a whole and in general are to be limited to minor components of the overall contract.

2. The contract amount upon which the requirements set forth in paragraph (1) of Section VI is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.

3. The contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the contracting officer determines is necessary to assure the performance of the contract.

4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the contracting agency has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.

5. The 30% self-performance requirement of paragraph (1) is not applicable to design-build contracts; however, contracting agencies may establish their own self-performance requirements.

VII. SAFETY: ACCIDENT PREVENTION

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract.

2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704).

3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704).

VIII. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, Form FHWA-1022 shall be posted on each Federal-aid highway project (23 CFR 635) in one or more places where it is readily available to all persons concerned with the project:

18 U.S.C. 1020 reads as follows:

"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 1, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined under this title or imprisoned not more than 5 years or both."

IX. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

By submission of this bid/proposal or the execution of this contract, or subcontract, as appropriate, the bidder, proposer, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any person who is or will be utilized in the performance of this contract is not prohibited from receiving an award due to a violation of Section 508 of the Clean Water Act or Section 306 of the Clean Air Act.

2. That the contractor agrees to include or cause to be included the requirements of paragraph (1) of this Section X in every subcontract, and further agrees to take such action as the contracting agency may direct as a means of enforcing such requirements.

X. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, consultant contracts or any other covered transaction requiring FHWA approval or that is estimated to cost or more – as defined in 2 CFR Parts 180 and 1200.

1. Instructions for Certification – First Tier Participants:

a. By signing and submitting this proposal, the prospective first tier participant is providing the certification set out below.

b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective first tier participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective first tier participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.

c. The certification in this clause is a material representation of fact upon which reliance was placed when the contracting agency determined to enter into this transaction. If it is later determined that the prospective participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the contracting agency may terminate this transaction for cause of default.

d. The prospective first tier participant shall provide immediate written notice to the contracting agency to whom this proposal is submitted if any time the prospective first tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

e. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. “First Tier Covered Transactions” refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). “Lower Tier Covered Transactions” refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). “First Tier Participant” refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). “Lower Tier Participant” refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

f. The prospective first tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.

g. The prospective first tier participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transactions," provided by the department or contracting agency, entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the threshold.

h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (https://www.epls.gov/), which is compiled by the General Services Administration.

i. Nothing contained in the foregoing shall be construed to require the establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of the prospective participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

j. Except for transactions authorized under paragraph (f) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – First Tier Participants:

a. The prospective first tier participant certifies to the best of its knowledge and belief, that it and its principals:

(1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency;

(2) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(3) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (a)(2) of this certification; and

(4) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

b. Where the prospective participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

* * * * *

2. Instructions for Certification – Lower Tier Participants:

(Applicable to all subcontracts, purchase orders and other lower tier transactions requiring prior FHWA approval or estimated to cost or more - 2 CFR Parts 180 and 1200)

a. By signing and submitting this proposal, the prospective lower tier is providing the certification set out below.

b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department, or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances.

d. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations. “First Tier Covered Transactions” refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). “Lower Tier Covered Transactions” refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). “First Tier Participant” refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). “Lower Tier Participant” refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.

f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the threshold.

g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (https://www.epls.gov/), which is compiled by the General Services Administration.

h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause.

The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

* * * * *

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – Lower Tier Participants:

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency.

2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

* * * * *

XI. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts which exceed (49 CFR 20).

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

   a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

   b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than and not more than for each such failure.

3. The prospective participant also agrees by submitting its bid or proposal that the participant shall require that the language of this certification be included in all lower tier subcontracts, which exceed and that all such recipients shall certify and disclose accordingly.

Schedule 16
Mandatory Terms

Part A: Subcontracting Terms

1. **Mandatory Terms for Subcontracts of Every Tier**

Each Subcontract (including each Principal Subcontract, except to the extent expressly provided otherwise below) shall:

(a) include an acknowledgement and agreement from the lower-tier Subcontractor (or, in the case of a Principal Subcontract, from the Principal Subcontractor):

(i) of and to all the terms of the Project Agreement to the extent expressly applicable to it as a Subcontractor;

(ii) that:

(A) the Colorado General Mechanics' Lien Statute, C.R.S. §§ 38-22-101, *et seq.*, is not available to such Subcontractor as a remedy for non-payment with respect to the Project and, as such, such Subcontractor shall not file or permit to be filed any mechanics' lien, materialmens' lien, or other lien against the Enterprises or CDOT, or the Project, in the records of the Clerk and Recorder of the City of Denver or in any other real property records;

(B) notwithstanding Section 1(a)(ii)(A) of this Part A of this Schedule 16, the Colorado Contractor's Bond and Lien on Funds Statute, C.R.S. §§ 38-26-101, *et seq.*, provides remedies to public authorities and subcontractors in the event of a non-payment of a subcontractor (which remedies are in the form of deductions by the public authority from payments to the contractor and liens by subcontractors against relevant payment bonds) and, therefore, pursuant to C.R.S. §§ 38-26-107 and, as contemplated by Section 5 of Schedule 5 (*Milestone Payments*), if such Subcontractor has an unpaid claim under its Subcontract, such Subcontractor may file a verified statement of the amount due and unpaid with the Enterprises at any time up to and including, but not after, the Substantial Completion Date (following which filing the Enterprises shall be entitled to withhold funds from Developer pursuant to Section 5(a)(i) of Part 3 of Schedule 4 (*Payments*) as a result of such claim); and

(C) such Subcontractor shall execute and deliver any lien waiver as and when required to be executed by it pursuant to Sections 2.4(b)(ii) or 2.4(b)(iii) of Part 2 of Schedule 4 (*Payments*) or Sections 4(c)(ii) or 4(c)(iii) of Schedule 5 (*Milestone Payments*); and

(iii) that:

(A) all notices, documentation and other information required to be delivered by Developer to the Enterprises or, as applicable, the Department pursuant to this Agreement shall be directly delivered by Developer and not by such Subcontractor acting, directly or indirectly, on Developer's behalf, except to the extent that the Enterprises Approve in advance the direct delivery of such type of notice by such Subcontractor to the Enterprises or, as applicable, the Department; and

(B) the Enterprises (and the Department) may, in their discretion, disregard any notice delivered by such Subcontractor contrary to Section 1(a)(iii)(A) of this Part A of this Schedule 16;

(b) incorporate all terms and provisions:

(i) that the Project Agreement requires to be expressly incorporated in such Subcontract; and

(ii) as are otherwise necessary for Developer to comply with its obligations under this Agreement with respect to the compliance of Subcontractors with certain provisions of this Agreement, including:

(A) Sections 8.1.2, 8.3.1.a, 8.5, 8.6.1.a, 15.1.1 (with respect to Principal Subcontracts only), 15.4.b, 17.5, 19.1, 20.1.2, 20.1.4, 20.1.5, 20.1.6, 25.2.7.b and 30.1.4.b of the Project Agreement; and

(B) Sections 2.1, 2.2, 2.3, 2.4, 2.5, 3, 4.2, 4.3, 5.2, 5.3, 5.4 and 6.4 of, and the Appendices to, Schedule 15 (*Federal and State Requirements*);

(c) require the lower-tier Subcontractor (or, in the case of a Principal Subcontract, the Principal Subcontractor) to:

(i) participate in meetings between Developer and Enterprises where requested in writing by either Developer or the Enterprises; and

(ii) cooperate with any reasonable requests for information or assistance provided to them through the Dispute Resolution Procedures, except to the extent that such cooperation would require such Subcontractor to assume any legal liability;

(d) contain all provisions necessary to ensure Developer shall comply with its obligations under Section 34.2 of the Project Agreement as they relate to such Subcontract;

(e) not otherwise contain terms that are contrary to or inconsistent with the Project Agreement; and

(f) provide that any amendment or waiver of any such Subcontract's provisions that would result in a violation of this Part A of this Schedule 16 shall be null and void unless Approved by the Enterprises.

2. **Mandatory Terms for Subcontracts (Excluding Principal Subcontracts)**

In addition to complying with Section 1 of Part A of this Schedule 16, subject to any exemptions that may be Approved by the Enterprises, each Subcontract (other than any Principal Subcontract) shall:

(a) not require from a Subcontractor the delivery to Developer or the higher-tier Subcontractor, as applicable, of any construction, payment or performance bond or letter of credit for an amount (in aggregate with all other such bonds and letters of credit) exceeding the aggregate value of the relevant Subcontract, provided that, if separate payment and performance bonds are required, each type of bond may separately be in an amount not to exceed such aggregate value;

(b) specify an alternative dispute resolution mechanism ("ADR") of referral for binding arbitration (which may be preceded by voluntary mediation) for payment disputes that complies with the following requirements:

(i) save to the extent expressly required otherwise by this Section 2(b), the ADR shall be conducted in accordance with the American Arbitration Association's Construction Industry Arbitration Rules and Mediation Procedures in effect from time to time;

(ii) the arbitrator(s) shall be mutually agreed by the parties to Subcontract at the time of, or prior to, referral;

(iii) either party to the Subcontract may require referral to ADR provided that, if the recipient of the invoice has not required referral within 90 Calendar Days after delivery of the invoice not paid or partially paid, the recipient shall irrevocably

waive its rights to dispute the relevant invoice. Delivery shall be deemed made when deposited in the U.S. mail postage prepaid or hand delivered;

(iv) the ADR shall provide for completion of the ADR process within 180 Calendar Days of delivery of the disputed invoice; and

(v) the prevailing party shall be awarded its costs provided that the arbitrator has discretion to require an equal split of the costs if there is no clearly prevailing party; and

(c) subject to Section 17.5.3 of the Project Agreement, provide that the relevant Subcontractor as payee submit monthly invoices in respect of any amount claimed as determined pursuant to Section 17.5.1.a through 17.5.1.d of the Project Agreement.

3. **Mandatory Terms for Principal Subcontracts**

In addition to complying with Section 1 of Part A of this Schedule 16, each Principal Subcontract shall:

(a) include a certification from the Principal Subcontractor to Developer that it does not and shall not knowingly employ or contract with an illegal alien to perform work under the Principal Subcontract; and

(b) provide that any action undertaken in breach of Section 17.1.3 of the Project Agreement shall be null and void.

Part B: Financing Terms

1. **Consistency with Term Sheets**

Each Financing Document entered into in connection with Financial Close shall be on terms materially consistent with (or, to the extent not materially consistent with, reflecting betterments to financial terms relative to) the relevant debt term sheets provided in the Proposer's Proposal.

2. **Mandatory Terms for Financing Documents**

(a) (i) Each Security Document shall include an acknowledgment and agreement as to Sections 27.3.1 and 27.3.2 of the Project Agreement and (ii) each Financing Document shall include an acknowledgment and agreement as to Sections 27.4.2 through 27.4.4 and 33.3 of the Project Agreement;

(b) each Security Document shall provide that any grant, assignment, mortgage, pledge, encumbrance, lien, charge or security interest made or created in violation of Sections 27.3.1 and 27.3.2 of the Project Agreement shall be null and void;

(c) each Financing Document shall not contain terms that are contrary to or inconsistent with the express terms of the Project Agreement; and

(d) each Financing Document shall provide that any amendment or waiver of any such Financing Document's provisions that would result in a violation of this Part B of Schedule 16 shall be null and void unless Approved by the Enterprises.

3. **Bond Recitals**

Except in the case of PABs issued by the PABs Issuer, each bond, promissory note or other instrument evidencing Project Debt shall include conspicuous recitals on its face to the effect that payment of the principal and interest under such bond, note or instrument:

(a) does not constitute a claim against the Enterprises', CDOT's or the State's title to or real property or other interest in this Agreement, the Project, any ROW Parcel or any Additional ROW Parcel or any part of any thereof;

(b) is not an obligation, moral or otherwise, of any of the Enterprises, CDOT or the State, any other State Governmental Authority, or any of their respective officials, board members, officers, directors, agents, employees and representatives; and

(c) neither the full faith and credit of the Enterprises, CDOT or the State, nor the taxing power of the State or of any other State Governmental Authority, is pledged to the payment of the principal of or the interest on such bond, note or instrument.

Schedule 17
Environmental Requirements

1. GENERAL

1.1. General Requirements

1.1.1. To the extent allowed by Law, subject only to the express provisions of this Agreement (including of this Schedule 17) and without limiting the Developer's own obligations to comply with all other Environmental Requirements applicable to the Project and the Work, the Department hereby delegates to the Developer, and the Developer hereby accepts, all the Department's obligations, commitments and responsibilities for environmental management and environmental compliance in accordance with the requirements identified in this Agreement and all applicable Environmental Law and Environmental Approvals. The Developer shall be responsible for creating environmental awareness among all Project personnel, ensuring completion of environmental tasks and mitigation, and documenting that the environmental aspects of the Construction Work and the O&M Work are completed in accordance with the foregoing delegation and all other applicable Environmental Law, Environmental Approvals and provisions of this Agreement. The Developer shall also assist the Department to implement any and all non-delegable obligations, commitments and responsibilities regarding applicable Environmental Law and Environmental Approvals. Unless specifically noted otherwise herein, the requirements of this Schedule 17 apply to all aspects of the Work, throughout both the Construction Period and the Operating Period.

1.1.2. Except as provided otherwise in this Agreement (including in this Schedule 17), the Developer shall in performing the Work:

a. Comply with all Environmental Law;

b. Comply with all conditions and requirements imposed by all Environmental Approvals;

c. Comply with all conditions and requirements imposed by all other Governmental Approvals (including all Department Provided Approvals) and Permits;

d. Perform all commitments and mitigation measures set out in all Environmental Approvals, all other Governmental Approvals (including all Department Provided Approvals, other than commitments and measures assigned to the Department in the Central 70 Mitigation Measures Status as provided in the Reference Documents) and all Permits; and

e. Pursuant to Section 8.4 of the Project Agreement, prepare all information and submissions required by, or necessary to maintain in full force and effect, all Department Provided Approvals and all other Environmental Approvals.

1.1.3. For certainty, the provisions of this Schedule 17, including all obligations of the Developer hereunder, are (except to the extent otherwise expressly provided herein) without prejudice to the Developer's rights and obligations arising as a result of the occurrence of any Supervening Event.

2. ENVIRONMENTAL COMPLIANCE WORK PLAN

2.1. General Requirements

2.1.1. The Developer shall prepare an Environmental Compliance Work Plan ("ECWP") that specifically identifies all of the environmental goals and compliance requirements for the Project and the Developer's detailed plan to meet or exceed those goals and requirements, and which is consistent with and expands upon the draft ECWP submitted with the Proposal. The ECWP shall be submitted to the Department for Approval (or, in the case of certain of the discipline specific management plans listed in Section 2.1.2 of this Schedule 17 and incorporated in the ECWP, Acceptance as specified in Table 17-5 (*Deliverables*)) prior to issuance of NTP2.

At a minimum, the ECWP shall comply with this Schedule 17 and the requirements of Section 14 of Schedule 10 (*Design and Construction Requirements*) and include the following:

a. All environmental elements defined in Exhibit 14 (*Central 70 Project Mitigation Measures*) of the ROD;

b. All elements assigned to the Developer in the Central 70 Mitigation Measures Status as provided in the Reference Documents;

c. All elements required by Environmental Law and Environmental Approvals;

d. Description of the means and methods to meet all Environmental Requirements during both the Construction Period and the Operating Period (to include, for example, detailed procedures that the Developer shall utilize to meet Environmental Requirements for dewatering in both the Construction Period and the Operating Period and any Government Approvals for removal, management, and disposal of RHMs the Developer shall seek);

e. Description of the process for tracking and documenting the progress and completion of all Environmental Requirements throughout the Construction Period and the Operating Period;

f. Description of how the Developer's Process Control ("PC") and Independent Quality Control ("IQC") programs shall function to assure compliance with Environmental Requirements and this Agreement;

g. Description of how information related to progress, completion and compliance with Environmental Requirements will be communicated to the Department and recorded in the Developer's DCS;

h. Description of the roles, responsibilities and qualifications for all members of the Developer's environmental management team, including the Environmental Manager ("EM");

i. All discipline specific management plans as required pursuant to Section 2.1.2 of this Schedule 17;

j. Description of the frequency and purpose of environmental field reviews; and,

k. Description of how site specific construction activities will meet all Environmental Requirements.

2.1.2. For certainty, specific Environmental Requirements (for example requirements related to air quality) will be addressed in the ECWP through discipline specific management plans, including those listed in this Section 2.1.2. The ECWP shall incorporate these discipline specific management plans by reference and they shall be considered part of the ECWP. The ECWP shall include details of how each discipline specific management plan will be incorporated into the overall environmental management program. The plans listed below shall be submitted to the Department for Approval or Acceptance as required by Table 17-5 (*Deliverables*).

a. Air Quality Monitoring, Maintenance, and Mitigation Plan;

b. Construction Noise Mitigation and Monitoring Plan;

c. Integrated Noxious Weed Management Plan;

d. Materials Management Plan;

e. Sampling and Analysis Plan;

f. Health and Safety Plan;

g. Spill Prevention Control and Countermeasures Plan; and

h. BTPD Management Plan.

2.1.3. The Developer shall monitor and improve the effectiveness of its ECWP and resubmit the ECWP annually for Approval (or, in the case of certain of the discipline specific management plans listed

in Section 2.1.2 of this Schedule 17 and incorporated in the ECWP, Acceptance as specified in Table 17-5 (Deliverables)) upon the anniversary of the ECWP's initial Approval by the Department, or more frequently should any of the following conditions exist:

a. A plan or procedure no longer adequately addresses the matters it was originally intended to address;

b. A plan or procedure does not conform with the Project Agreement;

c. An audit by the Developer or the Department identifies a deficiency in the ECWP requiring an update;

d. Organizational structure changes require revision to the ECWP; or

e. The Developer is undertaking, or about to undertake, activities that are not covered within the current ECWP.

2.1.4. For all ECWP updates submitted by the Developer to the Department (including updates to each discipline specific management plan) the Developer shall:

a. clearly identify in a cover sheet what changes were made in the plan update in order to expedite the Department's review; and

b. submit to the Department a comparison ("redline") copy of the ECWP, or the relevant parts thereof, together with an unmarked revised ("clean") copy of the ECWP.

3. INDEPENDENT QUALITY CONTROL PROGRAM

The Developer's IQC program, as described in Schedule 8 (*Project Administration*), shall assure compliance with all Environmental Requirements. The Developer shall perform IQC inspections to assure that the Construction Work meets and is being performed in accordance with this Agreement and all Environmental Requirements.

4. ENVIRONMENTAL STATUS AND MITIGATION COMPLETION REPORTS

4.1.1. The Developer shall report on the status of activities undertaken in accordance with the Environmental Requirements on a regular basis. During the period beginning with NTP1 through the Substantial Completion Date, the EM shall submit an Environmental Status Report ("ESR") monthly for Acceptance. During the Operating Period the Developer shall submit an ESR quarterly for Acceptance. The ESR shall be submitted no later than 10 Working Days following the end of the reporting period. The ESR shall:

a. Include the current status of compliance with the Environmental Requirements;

b. Include a section devoted specifically to water quality. This section shall summarize the water quality protection activities that have occurred during the reporting period and shall include a statement certifying that the Developer is in compliance with the CDPS-SCP, CDOT's MS4 Permit and the Construction Standards for Water Quality Control and Erosion Control. During the period beginning with the issuance of NTP1 through the second anniversary of Final Acceptance, the certification statement shall be signed by the Environmental Manager. After the second anniversary of Final Acceptance through the end of the Operating Period, the certification statement shall be signed by the Project Manager. If the certification statement cannot be signed, a separate Corrective Action Plan shall be submitted for Approval;

c. Document any pertinent environmental issues and include a narrative of the compliance actions and environmental activities which have occurred during the reporting period;

d. Include a summary of any stakeholder communications and Governmental Authority communications that have occurred during the reporting period;

e. Include a summary that lists the plan sets and submittals which have undergone environmental cross-disciplinary review since the last ESR;

f. Include dated photographs documenting environmental compliance and activities; and

g. Include any other content requirements specified in this Schedule 17 or other sections of the Project Agreement.

4.1.2. All narratives shall include enough detail to fully document the environmental activities. If the Department requests additional information be included in an ESR, the Developer shall revise the ESR and resubmit the report for Acceptance.

4.1.3. When all Environmental Requirements and environmental activities associated with the Construction Work that have been assigned to the Developer are complete, the Developer shall provide a Mitigation Completion Report. The Mitigation Completion Report shall document and certify the completion of all Environmental Requirements including environmental mitigation. The Developer shall submit the Mitigation Completion Report to, and obtain Acceptance thereof from, the Department prior to Final Acceptance.

5. ENVIRONMENTAL MANAGER, PROFESSIONALS AND TASK FORCE MEETINGS

5.1. Environmental Manager

5.1.1. The Developer shall employ an Environmental Manager ("EM") as and when required by Section 16.1 of the Project Agreement and Schedule 27 (*Key Personnel*), which EM shall (without limiting Developer's obligations with respect to such compliance) be responsible for ensuring compliance with all Environmental Requirements and commitments. The Environmental Manager shall implement all the environmental design, construction and operational commitments, all Environmental Requirements, and all conditions of the Environmental Approvals for the Project. The EM shall have the authority to stop or redirect the Work at any time as needed. The EM shall be responsible for the following:

a. Be the primary liaison between the Developer and the Department on environmental issues.

b. Be the lead responder to the Department for all NCNs and NCRs, each as defined in Schedule 8 (*Project Administration*), issued for the Environmental Requirements.

c. Provide support to the Independent Quality Control Manager ("IQCM") to ensure compliance with Environmental Requirements is included in inspections.

d. Conduct a weekly field review of the entire Project. A summary of the field reviews shall be included in the ESR.

e. Coordinate the implementation of procedures to meet all Environmental Requirements.

f. Ensure full compliance with all Environmental Requirements in the Work.

g. Ensure that environmental tasks are performed by qualified environmental professionals and provide the resources to perform the Work needed to meet the Environmental Requirements. Activities performed by environmental professionals shall be reported in the ESR and include the resumes of the individuals performing the Work.

h. Lead environmental cross-disciplinary reviews of all design submittals in order to confirm compliance with all Environmental Requirements and environmental design commitments. A summary of these reviews shall be included in the ESR.

i. Perform reviews of proposed Developer Changes prior to submittal to the Department of any related Developer Change Notice pursuant to Schedule 24 (*Change Procedure*). The submittal of a proposed Developer Change Notice by the Developer to the Department shall include documentation that the EM has performed due diligence and that the proposed Developer Change complies with the Environmental Requirements. A summary of these reviews shall be reported in the ESR.

j. Perform reviews equivalent to those described in Section 5.1.1.i of this Schedule 17 with respect to any Enterprise Change as required by the terms of an Enterprise Change Notice.

k. Measure the number and severity of non-conformances with the Environmental Requirements and include a summary of the findings in the ESR.

l. Implement improvement strategies to reduce the number and severity of non-conformances with the Environmental Requirements and include a summary of the findings in the ESR.

m. Monitor Work for conformance with Environmental Requirements and include a summary of the findings in the ESR.

n. Plan and implement the Environmental Compliance and Mitigation Training Program described in Section 6.1 of this Schedule 17.

o. Lead a field review with the Department to review the Project and environmental issues every month. This field review can be counted as a substitute for the EM's weekly field review for the relevant week.

p. Coordinate the participation of the appropriate members of the Developer's team for, and lead, environmental task force meetings as such meetings shall otherwise be conducted pursuant to Section 5.3 of this Schedule 17.

q. Attend all public and stakeholder meetings related to the Project and participate as needed.

r. Provide Mitigation Completion Report documenting and certifying the completion of all Environmental Requirements.

s. Develop site specific procedures/plans to meet the Environmental Requirements.

5.1.2. The EM's responsibilities shall not be delegated to production staff or other Persons without Department Approval.

5.2. Other Environmental Professionals

5.2.1. Where this Agreement requires work to be performed by a qualified environmental professional (e.g., a qualified wildlife biologist or a qualified highway noise specialist) the individual performing the work shall have the appropriate educational credentials and a minimum of two years' professional experience in the specific discipline, unless higher standards are specified. The qualifications of the environmental professional(s) performing the work shall be submitted to the Department as part of the ESRs and Mitigation Completion Reports (for example, the resumes of the biologists used during the prior month for completing Migratory Bird Treaty Act (MBTA) surveys shall be submitted with the ESR).

5.3. Environmental Task Force

5.3.1. The Developer shall conduct environmental task force meetings pursuant to Section 9.2.1 of Schedule 8 (*Project Administration*) and this Section 5.3.

5.3.2. Environmental task force meetings shall be held on a weekly basis during the Construction Period. During the Operating Period, the Department may require such meetings on an as needed basis.

5.3.3. The EM shall coordinate and lead the environmental task force meetings pursuant to Section 5.1.1.p of this Schedule 17. During the Operating Period, and after the required term for appointment of the EM set out in Schedule 27 (*Key Personnel*) has ended, the Developer's Project Manager (or, alternatively, an Approved designee) shall coordinate and lead such meetings.

6. ENVIRONMENTAL COMPLIANCE AND MITIGATION TRAINING PROGRAM

6.1. General Requirements

6.1.1. The Developer shall develop and implement an Environmental Compliance and Mitigation Training Program ("ECMTP") for the Developer's personnel, including those of Subcontractors who will enter within the Site boundaries to perform Construction Work and Renewal Work. All such personnel shall complete this training prior to performing Construction Work and any Renewal Work on the Project. In addition, IQC inspectors, IQC supervisory staff, and the IQCM shall participate in the ECMTP. The ECMTP shall cover the Environmental Requirements for the Project and train personnel to stay in compliance with the Environmental Requirements.

6.1.2. The ECMTP shall include the following elements:

a. Water quality requirements;

b. Wetlands and waters of the U.S.;

c. Maintaining approved limits of disturbance;

d. Tree and shrub protection;

e. Avoidance and minimization of impact to waterways and stormwater conveyances;

f. Seasonal work restrictions – trees, waterways, and migratory birds;

g. Pumping and dewatering operations;

h. Discovery of archaeological material or human remains;

i. Discovery of paleontological resources;

j. Hazardous Substances;

k. Historic property protection requirements;

l. Construction noise mitigation;

m. Dust and construction emissions mitigation;

n. Site general housekeeping measures;

o. Concrete and asphalt waste material management;

p. Spill prevention, response, and cleanup;

q. Protection and access requirements for parks and maintenance of trail detours;

r. Impacts and consequences for departure from approved operating procedures;

s. Additional topics as needed to maintain compliance with the Environmental Requirements; and

t. Responsibilities of production supervisors and inspectors in connection with environmental compliance.

The EM shall implement the ECMTP and submit it to the Department for Acceptance prior to issuance of NTP2. After NTP2 the Developer shall not allow any personnel to begin Work on the Site without completing the training required by the ECMTP. Construction Work conducted on the Site prior to the issuance of NTP2 shall be conducted under the environmental requirements of the CDOT Special Use Permit and otherwise subject to the early access and use provisions set out in Section 1.2 of Schedule 18 (*Right-of-Way*). The Developer shall revise the ECMTP regularly to reflect the most current policies, rules, and regulations and provide annual updates to the ECMTP to the Department for Acceptance 30 Calendar Days after the end of each Contract Year. The Developer shall keep records of the number of sessions and staff who has completed the ECMTP (for example, through the use of sign-in sheets, employee-specific identification numbers, hard hat decals etc.) and report this information monthly in the ESR.

7. DEPARTMENT PROVIDED ENVIRONMENTAL APPROVALS

The Environmental Approvals listed in Table 17-1 were obtained prior to the Agreement Date by the Department. These represent a portion of the Department Provided Approvals. Subject to Section 8.4 of the Project Agreement, Law, the terms of the applicable Department Provided Approvals and, with respect to the Programmatic Agreement only, Section 12.1.5 of this Schedule 17, the Department hereby delegates to the Developer responsibility to perform all conditions, commitments and requirements contained in or arising out of these and all other Department Provided Approvals.

Table 17-1 Department Provided Approvals

Environmental Approvals	Permitting Agency/Approval Agency
Record of Decision and Section 4(f) Evaluation	Federal Highway Administration ("FHWA")
Central 70 Reevaluation #1, dated September 18, 2017	FHWA
Programmatic Agreement	State Historic Preservation Office ("SHPO"), CDOT and FHWA

8. REQUIRED ENVIRONMENTAL APPROVALS

8.1.1. Pursuant to Section 8.4.2.a of the Project Agreement, the Developer shall be responsible for obtaining all Environmental Approvals (other than the Department Provided Approvals) required to perform its obligations under this Agreement. A non-exhaustive list of the Environmental Approvals that the Developer shall be required to obtain pursuant to Section 8.4.2.a of the Project Agreement is found in Table 17-2. Table 17-2 is provided for convenience only.

8.1.2. For certainty, the Developer shall also obtain any additional Environmental Approvals not listed in Tables 17-1 or 17-2 as and when required pursuant to its obligations under this Agreement.

8.1.3. The Developer shall provide copies of each Developer obtained Environmental Approval to the Department pursuant to Section 8.4.2.b of the Project Agreement and, in any event, prior to commencing any part of the Work that is regulated by such Environmental Approval. The Developer shall, subject to Section 49.1.1 of the Project Agreement, transmit the copies of each such Environmental Approval through the then current Document Control System.

8.1.4. Pursuant to Section 8.4.3.b of the Project Agreement, and without limiting Developer's rights under the Project Agreement (including with respect to any Supervening Event), the Developer shall also be responsible for performing all necessary actions and shall bear all risk of delay and/or all risk of increased cost, in either case, associated with Governmental Approvals (including, for certainty, Department Provided Approvals) and with Permits to the extent provided for in such Section, including in certain circumstances by obtaining new, or modifications, renewals and extensions of existing, Governmental Approvals (including, for certainty, Department Provided Approvals) and Permits.

Table 17-2 Required Environmental Approvals

Environmental Approvals	Permitting Agency/Approval Agency
Air Pollutant Emission Notice ("APEN")	Colorado Division of Public Health and Environment ("CDPHE") Air Pollution Control Division ("APCD")
Stationary Source Air Quality Permit	CDPHE APCD
Fugitive Dust Permit	CDPHE APCD
Asbestos Abatement Permit	CDPHE APCD
Demolition permits	CDPHE and all applicable Governmental Authorities
Historic Structures Demolition Permit	City and County of Denver Landmark Preservation Commission

Environmental Approvals	Permitting Agency/Approval Agency
Construction Noise Permit	All applicable Governmental Authorities
Temporary Noise Variance	All applicable Governmental Authorities
Clean Water Act Section 402 Construction Dewatering Permit	CDPHE Water Quality Control Division ("WQCD")
Construction Activities Stormwater Discharge Permit ("CASDP")	City and County of Denver ("CCD") – Wastewater Management
Colorado Discharge Permit System ("CDPS") Stormwater Construction Permit ("SCP")	CDPHE WQCD
Municipal Separate Storm Sewer System (MS4) Discharge Permit (CDOT MS4 discharge requirements)	CDPHE WQCD
Municipal Separate Storm Sewer System (MS4) Discharge Permit (outside CDOT ROW)	All applicable Governmental Authorities
Subterranean Dewatering or Well Development Permit	CDPHE WQCD
Construction Dewatering Permit	CDPHE WQCD
Remediation Activities Discharging to Surface Waters Permit	CDPHE WQCD
Remediation Activities Discharging to Groundwater	CDPHE WQCD
Individual Permit	CDPHE WQCD
Substitute Water Supply Plan	Colorado Division of Water Resources
Notice of Intent to Construct Dewatering Wells	Colorado Division of Water Resources
Well Construction and Test Reports	Colorado Division of Water Resources
Dewatering Systems Well Report	Colorado Division of Water Resources
Notification as Resource Conservation and Recovery Act ("RCRA") Generator (when the Developer is the Generator as determined pursuant to Section 23.6 of this Schedule 17; if the Department is the Generator as determined pursuant to Section 23.6 of this Schedule 17, the Department will submit this notification).	CDPHE Hazardous Materials and Waste Management Division
Stormwater Quality Discharge Permit for Construction Activities	City of Aurora
Sewer Use and Drainage Permit ("SUDP")	CCD
Well Abandonment Report (GWS-09)	State of Colorado, Office of State Engineer
Black Tailed Prairie Dog Removal Permit	Colorado Parks and Wildlife ("CPW") and City of Aurora
SB40 Certification/Approval	CPW
Nest Take Permit	The United States Fish and Wildlife Service ("USFWS")
Clean Water Act Section 404 Permit	United States Army Corps of Engineers ("USACE")
Special Use Permit	Colorado Department of Transportation

8.1.5. The Developer shall not pursue any new Environmental Approval, or seek to modify, renew or extend any existing Environmental Approval:

a. that reflects any change to the Project not described in the Preferred Alternative and/or the Reference Documents without Department Approval of the proposed new, modified, renewed or extended Environmental Approval; and

b. where the Environmental Approval or possible changed element of the Project is subject to any agreements CDOT or the Enterprises has or have made with State and local Governmental Authorities in connection with the Project (for example, the Programmatic Agreement) without Department Approval of the proposed new, modified, renewed or extended Environmental Approval.

8.1.6. The Department may, at its discretion, require the Developer to submit the Colorado Department of Transportation's Reevaluation Form (CDOT Form No.1399) in connection with the Developer obtaining any Environmental Approval, including any modification, renewal or extension thereof, and in connection with any Change made pursuant to Schedule 24 (*Change Procedure*) and documented in a Change Order or a Directive Letter.

9. ENVIRONMENTAL REQUIREMENTS FOR SPECIFIC ENVIRONMENTAL RESOURCES

9.1. General

9.1.1. The Environmental Requirements for specific environmental resources are set out in Schedule 10A (*Applicable Standards and Specifications*), the Central 70 Mitigation Measures Status, the FEIS, and the ROD. In addition, the Environmental Approvals and this Schedule 17 contain additional Environmental Requirements and/or clarifications of Environmental Requirements for specific individual environmental resources.

9.1.2. All environmental resources within and adjacent to the Site which are to be protected from disturbance during construction (for example wetlands and historic resources) shall be clearly shown on design Deliverables. The techniques and methods to be used for protection of the environmental resource (for example fencing and signage) shall be shown in the RFC Documents. The protective measures shall be put in place prior to work beginning in the area and maintained through the Construction Period.

10. AIR QUALITY

10.1. General Requirements

10.1.1. The Developer shall comply with all applicable air quality regulations and shall prepare and submit an Air Quality Monitoring, Maintenance, and Mitigation Plan ("AQ3MP"), for Acceptance, prior to issuance of NTP2.

10.1.2. The Developer shall be responsible for obtaining all air quality Permits necessary to complete the Work, including those listed in Table 17-2. The Developer shall have sole responsibility for compliance with all applicable air quality Environmental Approvals.

10.1.3. Air Quality Monitoring, Maintenance, and Mitigation Plan

a. The Developer shall prepare and implement the AQ3MP using the CDOT Air Quality Monitoring, Maintenance, and Mitigation Template, which is included in the Reference Documents. All template section and subsection headings shall be used. If a Section or subsection is not applicable, the reason it is not applicable shall be specified. New sections or additional subsections shall be added as necessary to fully describe the AQ3MP, identify personnel responsibilities, describe technical methodologies, list assumptions, and present procedures and methods for documenting and reporting. The AQ3MP will include the following:

i. Fugitive Particulate Emission Control

The Developer shall implement Best Management Practices ("BMPs") to effectively control fugitive particulate emissions at all times on the Site, including during periods of inactivity. The Developer shall monitor Project fugitive particulate emissions including those from construction equipment and stationary sources. The Developer shall perform and document a daily visual inspection of active Work sites within the construction site boundary with the goal of preventing off-Site transport of fugitive particulate emissions. If off-Site transport of fugitive particulate emissions occurs and is observed by the Developer or is reported to

the Developer, the EM and the Construction Manager shall immediately be informed. The Construction Manager, acting in consultation with the EM, shall investigate and ensure the implementation of appropriate additional BMPs to eliminate off-Site transport of fugitive particulate emissions.

ii. Opacity Measurements

The Developer shall perform and document daily opacity readings from all stationary sources that are operated on the Site that are subject to opacity limits in Section II.A of Air Quality Control Commission Regulation No. 1 (5 CCR § 1001-3) and any applicable Permit conditions. The Developer's personnel performing opacity readings shall be certified according to State and Federal standards and the certification status maintained throughout the duration of the Construction Work. The personnel performing the daily opacity readings on stationary sources may be the same personnel inspecting the Site for fugitive particulate emissions. If opacity readings exceed allowable limits, the inspector shall immediately inform the EM and the Construction Manager. The Construction Manager, acting in consultation with the EM, shall ensure the implementation of effective BMPs as described in the Central 70 Mitigation Measures Status to reduce opacity levels to allowable limits.

iii. PM-10 Monitoring

The Developer shall conduct continuous PM-10 monitoring during the Construction Period in accordance with 40 C.F.R. Part 58 (*Ambient Air Quality Surveillance*) adequate to characterize PM-10 concentrations along the active construction corridor. The AQ3MP shall specify the number, type, and location of PM-10 monitors that will make up the network and shall provide for hourly logging. At each station a PM-10 sampler will be installed in a climate controlled facility. The stations shall be designed to meet all applicable Federal, United States Environmental Protection Agency ("EPA"), and Colorado APCD standards. The Developer shall select PM-10 monitoring locations consistent with EPA siting criteria for surface data collection and shall provide rationale for location selection. Locations of the PM-10 monitors shall be adjusted during the Construction Period to accommodate construction phasing. The Developer shall calibrate the PM-10 monitors twice per week with no more than 4 Calendar Days between calibrations. Proposed locations of the PM-10 monitors shall be submitted to the Department for Acceptance at least two weeks prior to operating the monitor at the proposed location.

iv. Meteorological Data Collection

The Developer shall continuously monitor meteorological conditions including on-site wind-speed and wind gusts, wind azimuths, barometric pressure, relative humidity, and temperature, to assist in making decisions regarding mitigation of fugitive particulate emissions. This data may be collected at the PM-10 monitors or the Developer may obtain data from existing local data sources. If data is obtained from local sources, the sources being used shall be listed in the AQ3MP.

v. Project Independent Air Monitoring Data from Swansea Elementary

Air quality will be monitored at Swansea Elementary School as part of an independent research project that is not within the Developer's scope of Work. It is expected that the following criteria pollutants will be monitored: nitrogen dioxide (NO2), PM-10, and PM-2.5 as part of such independent research project. Additional pollutants may be added to the monitoring list. Monitoring results will be made available to the Developer. The Developer shall review such data as it

becomes available to identify trends to help determine if BMPs are being used effectively.

vi. Automated PM-10 Alert System

The Developer shall implement an automated PM-10 alert system that will communicate via both text messaging and email when a PM-10 monitored level reaches a running eight hour average concentration of 135 μg/m^3. This alert system will continuously monitor the real time data from the Project's PM-10 monitors. The level of 135 μg/m^3 is specified in order to allow corrective actions to be implemented prior to exceeding the National Ambient Air Quality Standard ("NAAQS") of 150 μg/m^3. The alert system shall inform the Construction Manager, EM, designated Department staff, and designated CDPHE Air Pollution Control Division staff of the PM-10 concentration and location of the alerting monitor. Upon receiving an alert, the Construction Manager, in consultation with the EM, shall respond immediately to identify the source of the PM-10 event and implement effective BMPs for dust control. This mitigation will continue until the next running eight hour PM-10 concentration from the alerting monitor is below 135 μg/m^3. All actions associated with responding to a 135 μg/m^3 or greater reading shall be communicated with the EM, designated Department staff, and designated CDPHE Air Pollution Control Division staff via email within one hour of the event.

vii. Posting of PM-10 and Meteorological Data

The Developer shall collect and submit PM-10 and meteorological data to the Department in an electronic format. This data submittal is for the purpose of posting on the Project website and is separate from the reporting requirements under Section 10.1.4 of this Schedule 17. Data for each 24-hour period shall be submitted to the Department prior to the end of the following Working Day. The data shall be submitted in a format and manner specified by the Department that allows the Department to review the data and post selected data. The PM-10 data shall be submitted in the following formats: (1) actual data for each individual reading, (2) the eight hour running average, and (3) the average for each 24-hour period. Meteorological data shall include temperature, humidity, wind speed, and wind direction for each reading. The results of the PM-10 monitor calibration shall be included in the data submittal.

viii. Air Quality BMPs

The Developer shall provide a list of air quality BMPs that the Developer will use for Construction Work and a description of how each will be implemented. BMPs are listed in the FEIS, ROD, and other Environmental Approvals.

ix. Alternative Fuels

The Developer shall undertake Reasonable Efforts to use alternatives to diesel engines and/or diesel fuels, such as biodiesel, liquefied natural gas, compressed natural gas, fuel cells, and electric engines. The Developer shall include a section in the AQ3MP describing the decision-making metric and results of the alternative fuel evaluation. The Developer may select any metric or metrics that meets the Project needs and requirements as determined by reference to this this Schedule 17 and the Project Agreement.

10.1.4. Air Quality Reporting

a. The Developer shall maintain a daily log of air quality observations and mitigation measures during all phases of the Construction Work and shall provide a monthly report and the monthly log of data collected to the Department in the ESR. The log shall include a daily report of the following information:

i. A description and location of construction activities being conducted on that day that could negatively impact air quality, including, for example, excavation, clearing and grubbing, demolition, and utilizing unpaved staging areas and haul roads.

ii. A report on the daily visual inspection of the Site, including a description of any visible emissions.

iii. The results, time and location of all opacity readings.

iv. A report on any observed or off-Site transport of visible emissions, and any violation of any other emissions guideline in Regulation No. 1, Section III.D. The report shall describe the duration of the event, the mitigation measures deployed and actions taken, and the time it took to correct the problem.

v. A report on any violation and compliance deficiency of the AQ3MP or Environmental Approval relating to air quality. The report shall describe the duration, time, and location of the event; the mitigation measures deployed and actions taken; and the time it took to correct the problem.

b. All hourly PM-10 and meteorological monitoring data and hourly eight-hour running average data from the PM-10 monitoring network and the meteorological monitoring station shall be recorded in a digital data logging unit and transmitted by a cellular or satellite system to an online data depository hourly managed by the Developer.

10.1.5. Diesel Nonroad Construction Equipment

a. For the purposes of this Schedule 17, the term Diesel Nonroad Construction Equipment ("DNRCE") shall refer to large (>50 hp), stationary and mobile, nonroad equipment, powered by compression-ignition (diesel) engines.

b. All DNRCE that is on Site for more than 10 total Calendar Days must either 1) have engines meeting EPA Tier 4 standards or 2) be EPA rated Tier 2 or Tier 3 that have been retrofitted with diesel particulate control technology, diesel oxidation catalysts, and/or engine preheaters. Retrofit systems and technology shall be selected to bring Tier 2 and Tier 3 DNRCE up to Tier 4 standards or as close to Tier 4 standards as practicable. DNRCE with Tier 0 and Tier 1 engines are not allowed on the Site.

c. Emission control technology shall be operated, maintained, and serviced as recommended by the emission control technology manufacturer.

d. All mobile DNRCE that is on Site shall comply with the idling restrictions and opacity requirements of the City and County of Denver's Code of Ordinances, including *Chapter 4 Air Pollution Control, Article IV Mobile Sources*.

e. The Developer shall ensure that all Subcontractors adhere to these requirements. The Developer shall maintain records of all DNRCE on Site at all times. The Developer shall submit a quarterly report to the Department summarizing the DNRCE present on the Site during the reporting period. The report shall include a table which lists: Equipment Type, Manufacturer, Model, Serial Number, Owner Information, Unique Identifier, Original Tier Level, and Retrofit Tier Level, Date brought on Site, Date removed from Site, and Number of Calendar Days on Site during the reporting period, and Total Number of Calendar Days on Site. The report shall also include a statement of certification by the Developer that all DNRCE on site during the reporting period have been listed in the Table. The quarterly report shall also include a list of DNRCE that the Developer plans to bring on to the Site during the next quarter.

10.1.6. Construction Equipment Emissions Retrofit Program

For information, the Developer should be aware that funding may be available from the Regional Air Quality Council ("RAQC") to retrofit certain types of construction equipment to reduce emissions. The Developer may be eligible to participate in this program. The Developer shall use

Reasonable Efforts to participate in, and report to the Department the details of their participation in, any RAQC retrofit program(s). To the extent that the Developer becomes entitled to participate in such program, any funding provided to it thereunder shall be independent of any payment obligations under, or payment provisions of, this Agreement.

10.2. Vehicle Idling

Without limiting the Developer's obligation to comply with any higher standard as required by Law or otherwise under the Project Agreement, all vehicles and equipment owned, leased, rented, or otherwise under the Developer's control shall not be allowed to idle for more than five consecutive minutes, except for idling:

a. when in operations queuing;

b. to verify safe operating condition;

c. for testing, servicing, repairing, or diagnostic purposes;

d. necessary to accomplish work for which the vehicle/equipment was designed (such as operating a crane);

e. to reach operating temperatures required by manufacturers' specifications; and

f. necessary to ensure safe operations of the vehicle/equipment.

11. NOISE

11.1. General Requirements

The Department has performed a noise impact analysis with abatement recommendations as part of the preliminary design for the FEIS and the ROD. The Statement of Likelihood and recommendations of this analysis are included in Section 5.12 of the FEIS and in the Noise Technical Report (Attachment K) of the FEIS. The noise analysis was completed using the roadway geometry documented in the FEIS and updated where applicable in the ROD. The Developer shall perform all required noise modeling, analysis, reporting, and related work in accordance with this Schedule 17 and the *CDOT Noise Analysis and Abatement Guidelines* dated January 15, 2015. For the purposes of this Section 11 of this Schedule 17, the term "Noise Technical Report" includes all of the elements listed in Appendix B of the CDOT Noise Analysis and Abatement Guidelines.

11.2. Noise Technical Report

11.2.1. The Developer shall perform a noise analysis based on its final design in the same locations of analysis that were included in the FEIS and the ROD. These locations include Globeville, Elyria and Swansea, Stapleton, Montbello, Aurora, and Peoria Street. Results of the noise analysis shall be documented in a preliminary and final Noise Technical Report for each such area and submitted to the Department for Acceptance. For information, the FHWA Traffic Noise models ("TNM") used in the FEIS and the ROD analysis are available to the Developer as a Reference Document.

11.2.2. The preliminary and final design noise analysis and Noise Technical Reports shall follow the format of the FEIS and the ROD analysis referenced above and include the same receiver locations as well as any new receivers that exist in the locations of analysis. The preliminary and final design noise analysis shall utilize the same model used in the FEIS and ROD.

11.2.3. The Noise Technical Reports shall determine and document the noise effects of any changes from the Reference Design. The Noise Technical Reports shall include a detailed description of any changes to the horizontal layout and/or the vertical elevation from the Reference Design. The Noise Technical Reports shall document the locations where any changes from the Reference Design have removed or altered shielding (either natural or man-made) thereby changing the line-of-sight between the receptor and the traffic noise source. The noise analysis and Noise Technical Reports shall determine if any new neighborhoods have become eligible for noise abatement. If any new areas become eligible for noise abatement due to changes from the

Reference Design, the Developer shall include the analysis for recommended noise abatement in the noise analysis and report. The Developer shall assure proposed mitigation is consistent with mitigation standards identified in the FEIS and the ROD, as well as State and Federal guidelines. The Developer shall submit documentation with the noise analysis and Noise Technical Reports verifying that the analysis was performed by a qualified individual with expertise in the field of highway noise analysis in Colorado.

11.2.4. Top of existing noise barrier elevations shall be documented before the removal of any existing structure. If final design noise analysis determines that top of barrier or structure elevations are lower than their existing elevations, the Developer shall demonstrate that no new visual sight lines are created.

11.3. New Noise Abatement

11.3.1. New noise abatement is required in the Elyria area as identified in Exhibit 49 of the ROD and in the mitigation descriptions found in Section 9.10 (Noise) of the ROD. Noise abatement measures recommended by the ROD cannot be removed from the Project unless adequate replacement acoustic benefit is restored and the change in abatement is Approved by the Department. New noise abatement is required in any additional areas required by Section 11.3.4 of this Schedule 17. In all areas receiving new noise abatement the Developer shall optimize the design of the noise abatement infrastructure to maximize the number of receivers receiving a reduction of 5 dBA or greater per CDOT/FHWA guidelines.

11.3.2. The Developer shall submit a preliminary Noise Technical Report which contains the optimized design of the proposed noise abatement in the affected neighborhood. Acceptance of the preliminary Noise Technical Report is required before the Benefited Receptor Preference Survey can be conducted.

11.3.3. When the preliminary Noise Technical Report has been Accepted by the Department, the Developer shall conduct the Benefited Receptor Preference Survey as described in the CDOT Noise Analysis and Abatement Guidelines. The Developer shall provide all material necessary to conduct the survey including exhibits, flyers, door hangers, ballots and return mail envelopes. The Developer shall conduct a public meeting on the proposed noise abatement design. The Developer shall allow the Department the opportunity for ongoing over the shoulder review of all planning activities associated with the Benefited Receptor Preference Survey. The Developer shall submit for Approval the plan of the Benefited Receptor Survey, including the geographic limits of the survey, procedures for conducting the survey, and printed material and other media to be used for the survey at least 14 Calendar Days before beginning the survey.

11.3.4. Additional new noise abatement shall be required if changes from the Reference Design, or any new Type I action, trigger eligibility in accordance with the CDOT Noise Analysis and Abatement Guidelines. New noise abatement infrastructure requirements triggered by design changes from the Reference Design, or any new Type 1 Action, shall be the responsibility of the Developer.

11.3.5. After the Benefited Receptor Preference Survey is completed, a Final Noise Technical Report shall be completed to document the final design noise analysis, final geometry and details of the noise barriers. This report shall be submitted to the Department for Acceptance prior to the issuance of RFC Documents. If any design changes are made that may affect eligible receivers, the Final Noise Technical Report shall be updated and resubmitted for Acceptance.

11.4. Existing Noise Abatement

11.4.1. All existing noise abatement structures that are removed, damaged, or otherwise impacted as a result of the Construction Work shall require full replacement. Replacement noise abatement structures shall be constructed to the structural and aesthetic requirements as set out in the Technical Requirements including Section 14 of Schedule 10 (*Design and Construction Requirements*). In the event that a noise abatement structure on the existing viaduct that is to remain in place (e.g. west of Washington Street) is damaged, the repair shall match the original design.

11.5. Additional Noise Abatement Requirements

11.5.1. Proposed noise walls shall be placed in locations that will accommodate the Ultimate configuration.

11.5.2. Noise walls and other abatement measures shall follow the requirements set out in Section 14 of Schedule 10 (*Design and Construction Requirements*) and the Aesthetic Design Standards for Central 70 included in Schedule 10B (*Contract Drawings*).

11.5.3. Noise walls shall be designed and constructed without open joints or gaps. Joints between noise wall Elements shall be minimized. Where joints are necessary, they will be designed is such a way that no light can pass through them. If a sealant is utilized to close any joint, it shall have a design life equal to or greater than the wall. Emergency access doors and hatches shall comply with the finish requirements of the Aesthetic Design Standards for Central 70 included in Schedule 10B (*Contract Drawings*). Proposed noise wall designs and location information shall be included in the Developer's public information program.

11.6. Construction Noise Mitigation and Monitoring

11.6.1. The Developer shall comply with all applicable local sound control and noise and vibration ordinances and regulations, including Chapter 36, Noise Control, of the Revised Municipal Code of the City of Denver. All required noise permits shall be acquired by the Developer prior to issuance of NTP2.

11.6.2. Central 70 Mitigation Measures Status contains mitigation measures for construction noise and vibration. The Developer shall implement a Construction Noise Mitigation and Monitoring Plan ("CNMMP") that incorporates the mitigation measures outlined in the FEIS, the ROD, and the procedures identified in the FHWA Construction Noise Handbook. The Developer shall submit the CNMMP to the Department for Acceptance prior to issuance of NTP2. The CNMMP shall be comprehensive and provide accurate and detailed information to minimize, monitor and mitigate construction-related noise and include the following compliance procedures with mitigation measures outlined in the FEIS and the ROD:

i. Compliance procedures with applicable noise ordinances or variances granted for the Project;

ii. Methodology to establish baseline ambient conditions;

iii. Identification of construction methods (for example, location of stationary equipment, truck traffic through residential areas, use of vibratory equipment such as pile driving, crusher plants etc.) for the Project;

iv. Identification of sensitive receptors, for both day and night construction and other Project-related activities;

v. Procedures for monitoring and reporting noise levels for the Project;

vi. Methodology to prevent, minimize and mitigate noise impacts related to demolition, debris removal, hauling, construction equipment, and construction activities.

vii. Implementation plan to construct noise barriers prior to roadway construction;

viii. Implementation plan to replace noise barriers as they are removed in locations that have existing noise barriers; and

ix. Implementation plan to meet construction noise minimization requirements around the Swansea Elementary School.

12. HISTORIC RESOURCES

12.1. General Requirements

12.1.1. The Developer shall perform all mitigation measures assigned to the Developer in this Schedule 17, the Programmatic Agreement, and in the Central 70 Mitigation Measures Status.

12.1.2. The Developer shall include the line work showing the Area of Potential Effect ("APE") boundary on all design drawings.

12.1.3. If the Developer's Work results in any changes in effects to the historic resources described in the FEIS and the ROD or in changes to the APE, the Developer shall obtain all required Environmental Approvals. The Developer shall document those changes and provide the Department with all necessary information and reevaluations for coordination with SHPO under Section 106 of the National Historic Preservation Act and Section 4(f) of the Department of Transportation Act. This shall include the enlargement of existing easements (temporary or permanent), or any additional easements (temporary or permanent), property acquisitions, Utility Relocations or alterations from work that has obtained concurrence from SHPO as documented in the Reference Documents, or resources that were not previously cleared as part of the Section 106 consultation and Section 106 Determinations of Eligibility and Effects report (Attachment I to the FEIS). The Developer shall not impact historic resources until the Section 106 consultation process is complete and Approved by the Department, FHWA, and SHPO. The Developer shall also be responsible for updating the Section 4(f) evaluation and obtaining Approval for any modifications to the Section 4(f) evaluation. Additionally (and without limiting Developer's obligations pursuant to the Project Agreement to obtain demolition permits as otherwise required from time to time to perform the Work), if the Developer purchases property in the Developer's name, the Developer shall obtain any required demolition permits for historic structures within the City and County of Denver from the Denver Landmark Preservation Commission.

12.1.4. The Developer shall protect in place all identified historic resources that are to remain through the Construction Period. Protection measures shall include fencing and additional measures referenced in Central 70 Mitigation Measures Status and/or the Programmatic Agreement. The Developer will maintain standard BMPs to minimize temporary impacts resulting in dust, debris, and auditory degradation.

12.1.5. The Programmatic Agreement is included in the Reference Documents and applies to this Project pursuant to Section 7 of this Schedule 17 and Section 8.1.1.d of the Project Agreement. The following paragraphs reference the stipulations in the Programmatic Agreement and allocate obligations under such stipulations as between the Department and the Developer (provided that, for certainty, all obligations under the stipulations not expressly referenced herein as having been retained by the Department have been delegated to the Developer pursuant to Section 7 of this Schedule 17):

a. Stipulation I, Reduction of Impacts. The Developer shall commit to reduce impacts to historic resources where feasible.

b. Stipulation II, Section 106 Consultation Process. If necessary the Department will consult with the SHPO and other consulting parties as required pursuant to Section 8.4.4 of the Project Agreement. The Developer shall provide all support required for Section 106 consultation in compliance with its obligations under Section 12.1.3 of this Schedule 17 and Section 8.4 of the Project Agreement.

c. Stipulation III, Mitigation; I. Archival Documentation. The Department will conduct the required archival documentation for the specific historic resources documented in the ROD. The Developer shall complete the required documentation for any remaining resources, including those identified post-ROD. The Developer shall complete any required archival documentation required due to changes to the APE or changes to the Reference Design.

d. Stipulation III, Mitigation; 2. Aesthetic Design. The Department will conduct the necessary coordination with SHPO and the consulting parties during the development of the Aesthetic Design Standards for Central 70 included in Schedule 10B (*Contract Drawings*) as required pursuant to Section 8.4.4 of the Project Agreement. The Developer shall design and construct the Project in accordance with the Aesthetic Design Standards, the Contract Drawings and all relevant Reference Documents.

e. Stipulation III, Mitigation; 3. Brick-Lined Sewers. The Developer shall be responsible for any mitigation requirements for impacts to brick-lined sewers outside those identified in the FEIS and ROD.

f. Stipulation III, Mitigation; 4. Creative Mitigation. The Department has completed this creative mitigation requirement.

g. Stipulation III, Mitigation; 5 Creative Mitigation. The Developer is not responsible for this mitigation requirement.

h. Stipulation III, Mitigation; 6. Additional Projects. The Department shall consult with SHPO and the Consulting Parties as required pursuant to Section 8.4.4 of the Project Agreement if additional projects are required. The Developer shall provide all support required for Section 106 consultation in compliance with its obligations under Section 12.1.3 of this Schedule 17 and Section 8.4 of the Project Agreement.

i. Stipulation III, Mitigation; 7. Historic Preservation Standards and Professional Qualifications. All work related to historic resources performed by Developer shall conform to the *Secretary of Interior's Standards and Guidelines for Archaeology and Historic Preservation* (48 FR 190:44716-44742).

j. Stipulation IV, Coordination with the National Environmental Policy Act. The Developer's and the Department's compliance with the Programmatic Agreement will fulfill this requirement.

k. Stipulation V, Coordination with Section 4(f) of the Department of Transportation Act of 1966 (Section 4(f)). The Developer's and the Department's compliance with the Programmatic Agreement will fulfill this requirement.

l. Stipulation VI, Construction Phase Post-Review Discoveries. If Unexpected Historically Significant Remains are discovered, the Developer shall immediately stop work in the vicinity of the discovery and inform the Department. The Developer shall protect the Unexpected Historically Significant Remains from degradation. The Department will consult with the SHPO and consulting parties as required pursuant to Section 8.4.4 of the Project Agreement.

m. Stipulation VII, Emergency Situations. The Developer is not responsible for management of this stipulation.

n. Stipulation VIII, Administrative Provisions. The Developer is not responsible for management of this stipulation.

13. SWANSEA ELEMENTARY SCHOOL

13.1. General Requirements

13.1.1. Prior to beginning Construction Work in the Swansea Elementary School area, the Developer shall construct the temporary wall as described in Section 14 of Schedule 10 (*Design and Construction Requirements*). The temporary wall shall remain in place until the Cover Planning Area 2 (as depicted in the I-70 Cover Plans) is open to the public.

13.1.2. The Developer shall minimize construction activities and construction impacts around Swansea Elementary School during school hours. The Developer shall include mitigation activities associated with Swansea Elementary School in the CNMMP, the AQ3MP and all other applicable plans. The Developer shall include the Swansea Elementary School Principal and appropriate

Denver Public School District personnel in all relevant activities to be conducted by the Developer pursuant to Schedule 14 (*Strategic Communications*) and keep them fully informed of all activities adjacent to the school.

13.1.3. Construction staging shall not occur within 500 feet of Swansea Elementary School except during the period of active construction of Cover Planning Area 1 (as depicted in the I-70 Cover Plans).

14. PALEONTOLOGY

14.1. General Requirements

14.1.1. The Developer shall retain a professional paleontologist, permitted through the Office of the State Archaeologist. During the Construction Period when the Denver and Arapahoe Formations are not exposed, the Developer's paleontologist shall spot check the Site weekly. During the Construction Period when bedrock of the Denver and Arapahoe Formations are exposed, the Developer's paleontologist shall provide continuous paleontological monitoring.

14.1.2. The Developer's paleontologist shall communicate with the Department to provide seven Calendar Days' notification to the Department's paleontologist informing them when work in the Denver and Arapahoe Formations is scheduled.

14.1.3. The Developer's paleontologist shall provide all reports required by the terms of their permits to the appropriate Governmental Authority and submit copies to the Department. The Developer's paleontologist shall provide a monthly summary of their activity on the Site to be included in the ESR. The Developer's Paleontologist shall provide Paleontological Annual Reports to the Department for Acceptance detailing work completed and fossils collected and curated to the Department. When all earthwork is completed, the Developer's paleontologist shall provide an end of Project Paleontological Summary Report to the Department for Acceptance.

14.1.4. During the Construction Period, the Developer's paleontologist shall communicate directly with the Department's paleontologist and allow on going over the shoulder review of all field activities. The Developer shall immediately notify the Department in the event of any discovery.

14.1.5. Upon discovery of any paleontological resources, the Developer shall immediately cease Work in the vicinity of the discovery, fence off the area, and allow the Developer's paleontologist to conduct sampling or excavation of specimens by hand or with mechanized equipment. If the paleontologist collects any specimens, all materials shall be curated following guidance provided in 8 CCR § 1504-7 – Historical, Prehistorical, and Archaeological Rules and Procedures. The Developer shall not resume Construction Work in the area until receiving formal notification from the Developer's paleontologist allowing Construction Work to resume.

15. PARKS AND RECREATION

15.1. General Requirements

15.1.1. The Developer shall reconfigure the Swansea Elementary School site and replace all playground facilities as required by Section 14 of Schedule 10 (*Design and Construction Requirements*).

15.1.2. During the Construction Period, segments of the South Platte River Greenway Trail and the Sand Creek Greenway Trail may be subject to temporary detours. Pursuant to Section 2.11.19 of Schedule 10 (*Design and Construction Requirements*) the Developer shall provide trail detours that comply with the Americans with Disabilities Act of 1990 ("ADA"). The Developer shall provide trail detour signage that complies with the ADA and Part 6F of the FHWA *Manual on Uniform Traffic Control Devices*.

15.1.3. Any reconstructed trail segment shall be rebuilt at minimum to match the existing facility. Any reconstructed trail segment shall be built to the Local Agency's current design and construction standards. Trail surfacing on any rebuilt trail segments will be constructed with new material and have smooth transitions to the undisturbed segments.

16. VEGETATION

The Developer shall minimize tree removal and disturbance to native plant communities, especially wetlands, prairie dog towns, riparian areas, and upland trees and shrubs. All native and non-native trees outside of Senate Bill 40 ("SB 40") jurisdictional areas that are removed that are over four inches diameter at breast height shall be replaced with native trees on a 1:1 basis. All riparian shrubs outside of SB 40 jurisdictional areas that are removed shall be replaced with native shrubs based on areal coverage on a 1:1 basis. The riparian areas are shown in the Reference Documents. New and replacement vegetation shall conform to Section 14 of Schedule 10 (*Design and Construction Requirements*). Additional requirements to avoid, minimize, and mitigate for impacts to vegetation are found in the FEIS and the ROD.

17. SENATE BILL 40 WILDLIFE CERTIFICATION

17.1. General Requirements

17.1.1. The Developer shall evaluate the final design to determine if and how the SB 40 Application Criteria apply as defined by CDOT's *Guidelines for Senate Bill 40 Wildlife Certification*. The Developer shall not perform Construction Work within SB 40 jurisdictional areas until CPW issues a Programmatic or Formal SB 40 Certification.

17.1.2. If a Programmatic SB 40 Certification is required pursuant to Law and CDOT's *Guidelines for Senate Bill 40 Wildlife Certification*, the Developer shall prepare and submit to the Department the applicable SB 40 Certification application package for Approval, with all documentation required by the CPW Regional Wildlife Manager. Upon Approval, the Department will submit the application package to CPW. Approval of the application package by the Department does not constitute approval by CPW.

17.1.3. If a Formal SB 40 Certification is required pursuant to Law and CDOT's *Guidelines for Senate Bill 40 Wildlife Certification*, the Developer shall prepare and submit to the Department the applicable SB 40 Certification application package for Approval, with all documentation required by the CPW Regional Wildlife Manager. Upon Approval, the Department will submit the application package to CPW. Approval of the application package by the Department does not constitute approval by CPW.

17.1.4. In SB 40 jurisdictional areas, trees removed during construction, whether native or nonnative, shall be replaced with native trees at a 1:1 replacement ratio based on a stem count of all trees with a diameter at breast height of two inches or greater. Shrubs removed during construction, whether native or nonnative shall be replaced with native shrubs on a 1:1 ratio based on their pre-construction areal coverage.

17.1.5. Tree and shrub mitigation for SB 40 impacts shall also conform to the requirements set out in Section 14 of Schedule 10 (*Design and Construction Requirements*).

18. INTEGRATED NOXIOUS WEED MANAGEMENT PLAN

18.1. General Requirements

18.1.1. The Developer shall take actions as necessary to control all noxious weeds throughout the Construction Period and the Operating Period. The Developer shall implement proactive procedures to eradicate the occurrences of List A species on the Site. The Developer shall implement proactive procedures to eliminate the occurrences of List B species in areas of the Site where the ground has been disturbed by the Work, and reduce the occurrences of List B species on the remainder of the Site.

18.1.2. The Developer shall submit an Integrated Noxious Weed Management Plan ("INWMP") to the Department for Acceptance prior to the issuance of NTP2. The INWMP shall be implemented during the Construction Period and the Operating Period and will include identification of noxious weeds in the area, weed management goals and objectives (specific to levels of disturbance), and preventive and control methods. The INWMP shall convey that List A species are eradicated throughout the Project; management of List B species may vary based on disturbance activities

and Colorado Department of Agriculture and local requirements (for example, elimination of List B species in disturbed areas and management for suppression in areas with no ground disturbing activities).

18.1.3. The INWMP shall also include a requirement for recurring noxious weed surveys. During the Construction Period the noxious weed survey shall be conducted monthly from March 1 through October 31. During the Operating Period the noxious weed survey shall be conducted three times per year spread evenly over the growing season. The Developer shall create a monthly Schedule of Planned Noxious Weed Management Activities based on the findings of the latest noxious weed survey that shall be submitted to the Department for Information.

18.1.4. The Developer shall submit a Noxious Weed Survey and Summary of Treatment Activities Report to the Department for Acceptance for each month beginning with March and continuing through October during the Construction Period and three times per year during the Operating Period. The Noxious Weed Survey and Summary of Treatment Activities Report shall include the noxious weed survey that was completed during the reporting period and a summary of the treatment activities that were implemented.

18.1.5. The INWMP shall address the control methods (chemical, biological, cultural, etc.) that will be put in place to identify control methods for List C species, stop the continued spread of List B species and to eradicate the occurrences of any List A species.

18.1.6. The Developer shall assign a qualified representative to be responsible for implementing the INWMP. This representative shall be directly responsible for weed identification, mapping, scheduling herbicide application, noxious weed herbicide selection, and developing criteria for topsoil salvage (for example, topsoil inspection and/or sampling protocols). A résumé documenting the representative's qualifications shall be included in the Noxious Weed Survey and Summary of Treatment Activities Report.

18.1.7. The IQC program shall include monitoring of noxious weed management activities (such as treatment of stockpiles and collection of weed-free certifications of mulch and imported soil).

18.1.8. Noxious weeds observed in and near the construction area at the start of construction will be treated with herbicides or physically removed to prevent seeds blowing into disturbed areas during construction. Noxious weeds identified during construction shall be identified and treated.

18.1.9. Additional requirements of the INWMP shall include:

a. Initial identification and mapping of the baseline conditions for List A, List B, and List C noxious weed species present on the Site prior to the issuance of NTP2;

b. Schedule and procedures for mechanical and chemical practices prior to topsoil salvage and earthwork operations. Potential areas of topsoil salvage shall be assessed for presence and abundance of noxious weeds prior to salvage. Topsoil from infested areas, as defined in the INWMP, shall be treated by spraying, taking the topsoil off-Site, or by burying the topsoil during construction;

c. Noxious weed management practices in sensitive areas (on-site wetlands and threatened and endangered species habitat);

d. Procedures for the inspection and washing of the Developer's vehicles before they are used for construction to ensure they are free of soil and debris capable of transporting noxious weed seeds or roots;

e. Areas of temporary disturbance shall be reclaimed in phases throughout the Project and seeded using a permanent native seed mixture. If areas are complete and permanent seeding cannot occur due to the time of year, mulch and mulch tackifier shall be used for temporary erosion control and weed prevention until seeding can occur;

f. Only certified weed-free mulch and bales shall be used;

g. Weed control will use the principles of integrated pest management to treat target weed species efficiently and effectively by using a combination of two or more management techniques (biological, chemical, mechanical and/or cultural). Weed-control methods shall be selected based on the management goal for the species, the nature of the existing environment and methods recommended by the Colorado Department of Agriculture. The presence of important wildlife habitat or threatened or endangered species habitat shall be considered when choosing control methods;

h. The Developer shall identify and delineate areas of noxious weed infestations and include written instructions in the INWMP detailing herbicide or other appropriate weed control measures required for weed infestations identified during the monitoring work;

i. Noxious weed management after earthwork operations and stabilizing has been completed shall require chemical and mechanical methods that do not disturb native seeding and mulching areas;

j. Weed-infested staging areas shall not be allowed. Staging areas shall be mowed and cleared of noxious weeds and sprayed with the appropriate herbicide, or as referenced in the Colorado Department of Agriculture species fact sheets;

k. Topsoil salvaged from the Site and stockpiled for reuse on the Site shall be treated in accordance with the methodology described in the INWMP to eliminate noxious weeds prior to salvage. The topsoil stockpiles shall be monitored during the monthly noxious weed Surveys and treatment shall be implemented as needed; and

l. If imported topsoil is used for any part of the Project, the topsoil shall be inspected and certified noxious weed free.

19. VISUAL

The Developer shall comply with the aesthetic Element requirements of the Technical Requirements and Section 14 of Schedule 10 (*Design and Construction Requirements*).

20. WATER QUALITY CONTROL AND WATER RESOURCES

20.1. General Requirements

20.1.1. The Developer shall retain and utilize a SWMP Administrator as required by the Project Special Provisions revision of Section 208 in Appendix A to this Schedule 17 (hereafter referred to as "Section 208"). The Developer's Process Control ("PC") program shall retain and utilize Erosion Control Inspector(s) as required by Section 208.

20.1.2. Water quality activities shall be conducted in accordance with Section 208.

20.1.3. The ECWP shall include an organization chart identifying the key personnel responsible for implementing the Developer's water quality compliance activities. The plan shall specifically identify the individuals and positions who shall serve in the roles referenced in Section 208. The plan shall include a detailed description of the roles that the PC and the IQC programs shall be assigned in the quality control and quality assurance of water quality activities. The plan shall provide details of how the Developer shall respond in the event of recurring nonconformance events.

20.1.4. The IQC program shall include compliance with water quality requirements as part of all inspection and field reviews and shall issue Nonconformance Reports ("NCRs") if required to bring the Project into compliance with the CDPS-SCP, CDOT's MS4 permit, and the Construction Standards for water quality and erosion control. The IQC program shall retain and utilize inspector(s) who have successfully completed the Transportation Erosion Control Supervisory Certificate Training ("TECS") as provided by the Department. One TECS certified inspector shall be required for every 40 acres of total disturbed area, or portion thereof, which is at any time actively receiving temporary and interim stabilization measures as defined in Section 208.04(e) of Section 2.08.

20.1.5. The IQC program shall audit the SWMP Notebook monthly during the period from the issuance of NTP2 until Final Acceptance. The material to be audited includes CDOT Form No. 1388 and all items required in Section 208.03(d)1. As part of this audit, all such items required in Section 208.03(d)1 (*e.g.* the Daily Inspection Forms (CDOT Form No. 1388), Form 1176 Inspection Reports, documentation of the corrective action for any findings, Form 105, all other correspondence relating to water quality, and any reports of reportable spills submitted to CDPHE) shall be scanned and entered into the DCS in electronic format. A summary of the audit, any audit findings, and the scanned material shall be submitted to the Department monthly.

20.1.6. The Developer shall determine the specific Governmental Approvals and Permits required for the Work. The Developer will be responsible for obtaining and will be the designated entity under all of the water quality permits related to construction activities.

20.1.7. The Developer shall immediately notify the Department of any suspected illicit or improper connections or discharges into any storm sewer system discovered during construction of the Project.

20.1.8. The Developer shall design, construct, and maintain temporary and permanent water quality elements in a manner that prevents or, to the fullest extent practicable, minimizes the creation of mosquito breeding habitat.

20.1.9. If during the Construction Period the Developer's dewatering practices result in a Consumptive Use of the water, the Developer shall obtain all applicable Permits and Governmental Approvals for such Consumptive Use. If required, the Developer shall also obtain a Substitute Water Supply Plan from the Colorado Division of Water Resources for all temporary dewatering activities. The Developer shall document compliance with the foregoing requirements and submit such documentation with the ESR.

20.1.10. If any dewatering activities are required during the Operating Period, the Developer shall design, operate, and maintain the dewatering system so that no Consumptive Use of the water occurs. The Developer shall document compliance with the foregoing requirement and submit such documentation information with the ESR.

21. WETLANDS/WATERS OF THE U.S. AND SECTION 404 PERMIT

21.1. General Requirements

21.1.1. Impacts to jurisdictional wetlands shall not exceed those impacts described in the FEIS and the ROD and are shown in the Existing Wetland Delineation provided in the Reference Documents. The Developer shall further minimize impacts to wetlands as the design is finalized to the fullest practicable extent.

21.1.2. The Developer shall obtain a Clean Water Act, Section 404 Permit for impacts to wetlands and waters of the U.S. The Developer shall be responsible for mitigating unavoidable impacts to such wetlands and waters. It is anticipated that a Nationwide Permit 14 (Linear Transportation Projects) will apply to this Project because impacts to jurisdictional wetlands based on the Preferred Alternative are less than the 0.5 acre threshold. The actual Permit requirements are subject to the Developer's design and approval by the U.S. Army Corps of Engineers.

21.1.3. Concurrent with any mitigation requirements mandated by the Section 404 Permit, the Developer shall mitigate for both jurisdictional and non-jurisdictional permanent wetland impacts at a 1:1 ratio per CDOT policy. Mitigation in a wetland mitigation bank located in the South Platte River watershed is acceptable to the Department. The Developer shall comply with the requirements and special conditions outlined in the Section 404 Permit and 401 Certification.

21.1.4. If wetland impacts exceed the thresholds identified in the 2006 *Memorandum of Agreement between FHWA and CDOT Regarding the Programmatic Approval of Wetland Findings*, the Developer shall submit a Wetland Finding Report for Approval prior to impacting wetlands. A CDOT Functional Assessment of Colorado Wetlands ("FACWet") shall be performed if a Wetland Finding is required.

21.1.5. The Developer shall protect any wetlands within the Site or adjacent to it that are to remain undisturbed. Protected wetlands shall be fenced and marked with signs (and included on design drawings) to keep Project personnel and equipment out. Water quality BMPs shall be utilized to keep sediment out of any protected wetland. The Developer shall restore any wetlands that are temporarily impacted.

22. WILDLIFE

22.1. Black-tailed Prairie Dogs

22.1.1. There are existing Black-tailed prairie dog ("BTPD") colonies within the Site that could be impacted during the Construction Period. The CDOT *Impacted Black-tailed Prairie Dog Policy* applies if BTPD colonies are impacted. CPW also regulates certain activities associated with impacts to BTPD. Local Agencies for the Project may have regulating policies to address BTPD populations, as well. The Developer shall be responsible for complying with applicable Law associated with BTPD. When there are conflicting policies, the most stringent policy shall be followed.

22.1.2. Prior to conducting any activities that could potentially impact BTPD, the Developer shall submit a BTPD Management Plan for Department Acceptance. This plan will be submitted to Governmental Authorities for approval, as required by their policies. At a minimum, the plan shall comport with the obligations identified in Section 5.13.5 of the FEIS, C.R.S. § 35-7-203, and the CDOT *Impacted Black-Tailed Prairie Dog Polic*y.

22.1.3. The plan shall outline the anticipated impacts and how the Developer shall comply with CDOT policies, Local Agency requirements and Environmental Requirements. If BTPDs are relocated or removed during the burrowing owl nesting season (March 15 through October 31), the affected habitat shall be surveyed by a qualified wildlife biologist for the presence of burrowing owls no more than seven Calendar Days prior to initiating relevant construction activities.

22.2. Migratory Bird Treaty Act

The Developer shall comply with the Migratory Bird Treaty Act ("MBTA") at all times. Protection of migratory birds under the MBTA shall be in accordance with the Project Special Provisions to this Schedule 17.

22.3. Colorado Butterfly Plant (*Gaura neomexicana*)

Suitable habitat for the Federally threatened Colorado butterfly plant occurs along the South Platte River and Sand Creek. The Developer shall have a qualified botanist conduct surveys for this species during the flowering season within and adjacent to the areas of disturbance at the South Platte River and Sand Creek prior to the commencement of construction activities in these areas. If these areas remain undisturbed between the initial survey and subsequent flowering seasons, the areas shall be re-surveyed each flowering season. Impacts to these areas shall not occur until surveys are complete and it is confirmed that the species is not present. If Colorado butterfly plants are found, the Developer shall notify the Department immediately. Prior to impacting the Colorado butterfly plant, the Developer shall obtain all required Environmental Approval(s) as required pursuant to this Agreement.

22.4. Ute Ladies'-tresses Orchid (*Spiranthes diluvialis*)

Suitable habitat for the Federally threatened Ute ladies'-tresses orchid may occur along the South Platte River and Sand Creek. The Developer shall have a qualified botanist conduct surveys for this species during the flowering season within and adjacent to the areas of disturbance at the South Platte River and Sand Creek prior to the commencement of construction activities in these areas. If these areas remain undisturbed between the initial survey and subsequent flowering seasons, the areas shall be re-surveyed each flowering season. Impacts to these areas shall not occur until surveys are complete and it is confirmed that the species is not present. If Ute ladies'-tresses orchid are found, the Developer shall notify the Department immediately. Prior to impacting the Colorado butterfly plant, the Developer shall obtain all required Environmental Approval(s) as required pursuant to this Agreement.

22.5. Burrowing Owl (Athene cunicularia)

High-quality habitat for the State-threatened burrowing owl occurs in association with BTPD colonies that are located throughout the Site area. The Developer shall have a qualified biologist perform burrowing owl surveys following CPW protocols no more than seven Calendar Days prior to the commencement of Construction activities. The survey shall occur during the burrowing owl nesting season (March 15 to October 31) prior to the removal of any BTPD within the Site. If nesting pairs are identified, the Developer shall notify the Department immediately and Construction Work shall not occur within 150 feet of an active nest site between March 15 and October 31, or as determined necessary by a Department wildlife biologist. If a nest becomes occupied after the start of construction activities in any part of the Site, a seasonal buffer zone shall be required during the burrowing owl nesting season to prevent violation of the Migratory Bird Treaty Act.

23. RECOGNIZED HAZARDOUS MATERIALS

23.1. General Requirements

23.1.1. "Recognized Hazardous Materials" (RHMs) are any Hazardous Substances (including soil or water contaminated with Hazardous Substances) present on, in or under any part of the Site (including on or in any building or structure, including any bridge), at concentration levels or in quantities that are required to be investigated, removed, treated, stored, transported, managed and/or remediated:

a. pursuant to Law, provided that (for certainty) Developer's responsibility shall not extend to RHMs outside the Site except with respect to Developer Releases of Hazardous Substances; or

b. pursuant to Developer's obligations under this Agreement, including under Section 23.1.2 of this Schedule 17.

For certainty, RHMs may be naturally occurring or man-made, exist on the surface or subsurface, in groundwater or surface water, or structures to be demolished or modified as part of the Work, and may be mixed with soil, water, building materials, and/or other waste materials. For certainty, RHMs include any materials contaminated with Hazardous Substances above the residential screening levels set forth in and defined as "RSL-R's" in the BRMMP).

23.1.2. Except as provided otherwise in this Agreement (including in this Schedule 17), and without prejudice to the Parties' responsibilities under Section 23.6 of this Schedule 17, the Developer shall be responsible for the identification, investigation, removal, treatment, storage, transportation, management, and/or disposal of RHMs during the Term in compliance with Environmental Law, any applicable Governmental Approvals and Permits, the terms of this Agreement, and the Construction Standards, including Project Special Provisions revision of Section 250 in this Schedule 17 (hereafter referred to as "Section 250"). The Developer shall provide all qualified staff and equipment to respond to RHMs in accordance with and to the extent required by such requirements.

23.1.3. For certainty, if Developer's performance of its obligations pursuant to Section 23.1.2 of this Schedule 17 would entitle it to seek compensation or relief pursuant to Section 15 of the Project Agreement as the result of the occurrence of a Supervening Event, the Department may, pursuant to Section 14 of the Project Agreement and Schedule 24 (*Change Procedure*), require an Enterprise Change, to be documented in a Change Order or a Directive Letter, to the effect that the Department (or its designee) shall assume responsibility, in whole or in part, for the identification, management, removal and/or disposal of RHMs in connection with such Supervening Event.

23.2. Background Information

23.2.1. The Department has completed environmental surveys within the Right-of-Way that have identified RHMs and potential RHMs. Information regarding RHMs are identified in a variety of documents, including the following:

a. The Hazardous Materials section of the FEIS and the Hazardous Materials Technical Report within Attachment H of the FEIS describes the results of an environmental records search for Hazardous Substances that was conducted by the Department;

b. The Limited Subsurface and Groundwater Investigation Report that summarizes the limited subsurface and groundwater investigations focused on the Preferred Alternative ground disturbance areas provided in the Reference Documents;

c. The Asbestos and Limited Lead-Based Paint Inspection reports provided in the Reference Documents, which reports document sampling for asbestos containing building materials and lead-based paint on bridges;;

d. Certain Phase I Environmental Site Assessments ("ESAs") as described in Section 2.2.5 of Schedule 18 (*Right-of-Way*).

e. City and County of Denver Limited Phase II Environmental Site Assessment for the National Western Center Redevelopment Project; and

f. EPA Record of Decision for the Vazquez Boulevard/Interstate 70 Superfund Site.

23.2.2. Without limiting its obligations under any other provision of this Agreement or its rights under this Agreement arising as a result of the occurrence of any Developer Change documented in a Change Order or any Supervening Event, the Developer shall read, conduct diligence of and be deemed to have knowledge of, all environmental due diligence materials referenced in Section 23.2.1.d of this Schedule 17 as and when available to it.

23.3. Supplemental RHM Diligence

If the Developer deems it prudent for planning, scheduling, regulatory or other purposes, the Developer may conduct investigations to identify and evaluate RHMs. Subject to the express terms of this Agreement, such additional investigations shall be at the sole cost and responsibility of the Developer.

23.4. Groundwater

23.4.1. The substances identified in the column headed "Chemical Name" in Appendix C to this Schedule 17 include substances documented in the Reference Documents as existing in the groundwater prior to the Setting Date. For certainty, Appendix C, including the concentration levels of such substances included in the "Value" Column of Appendix C:

a. has been provided only for purposes of the definition of Unexpected Groundwater Contamination Conditions in Part A of Annex A (*Definitions and Abbreviations*) to the Project Agreement, Section 8.4.4.f of Schedule 10 (*Design and Construction Requirements*) and Section 23.4.4.b.i of this Schedule 17; and

b. shall otherwise be treated as Project Information, including for purposes of Section 3.1 of the Project Agreement and Schedule 2 (*Representations and Warranties*).

23.4.2. The Developer is responsible for the identification, investigation, removal, treatment, storage, transportation, management and/or disposal of RHMs in the groundwater during the Term (whether or not any such RHM involves a substance identified in Appendix C) as and to the extent provided pursuant to Section 23.1.2 of this Schedule 17.

23.4.3. Developer shall maintain records of all costs and expenses incurred in connection with its and its Subcontractors' performance of the obligations described in Section 23.4.2, including records of all costs and expenses of the types specified in Paragraphs a., b. and c. of the definition of Excess Groundwater Costs in Part A of Annex A (*Definitions and Abbreviations*) to the Project Agreement (whether or not such costs and expenses are incurred in connection with any Unexpected Groundwater Contamination Condition).

23.4.4. In order for Developer to establish the existence of any Unexpected Groundwater Contamination Condition, the following conditions must be satisfied:

a. Developer shall have provided notice to the Department of any such suspected Unexpected Groundwater Contamination Condition. In order to be valid, such notice shall include effluent sampling results from a groundwater discharge point that indicate one or more RHMs exceed the discharge limits applicable to such discharge point under the applicable dewatering permit (referred to in this Section 23.4.4 as the "Exceedance Chemicals").

b. Developer shall promptly supplement its initial notice pursuant to Section 23.4.4.a of this Schedule 17 with the following additional information:

i. sample results that indicate, at the time of such exceedance, the Exceedance Chemicals at the pre-treatment effluent sample location (defined as the point in the treatment process after which solids have been removed or at the initial dewatering point if total suspended solids ("TSS") at such initial point are less than 30 milligrams per liter ("mg/L") for such discharge point also:

A. exceeded the applicable value set out in Appendix C to this Schedule 17 with respect to any RHM listed in such Appendix; or

B. indicated the presence of an RHM that is not listed in Appendix C to this Schedule 17; and

ii. sample results that indicate TSS at the pre-treatment effluent sample location for such discharge point (collected at the same time as the pre-treatment sample) were less than 30 mg/L.

For purposes of this Section 23.4.4.b, TSS may be determined by laboratory analysis or by an alternative method, so long as the Developer provides proof of concept and obtains Department Approval of such alternative method in advance of submitting such data.

c. After the Department's receipt of any Developer notice (and supplemental information) that complies with Section 23.4.4.a and 23.4.4.b of this Schedule 17, the Department shall collect contamination confirmation samples from the same location as the pre-treatment effluent sample reported in such notice as follows. The Department shall collect:

i. an initial sample within 24 hours of receipt of Developer's notice; and

ii. follow-up samples every seven Calendar Days thereafter (or, at Department's discretion, more frequently) until the condition is determined to not exist or to have ended pursuant to Section 23.4.5 of this Schedule 17.

In order to confirm the existence or continuation, as applicable, of either the condition set out in Section 23.4.4.b.i.A of this Schedule 17 or the condition set out in Section 23.4.4.b.i.B of this Schedule 17, any sample collected by the Department pursuant to this Section 23.4.4.c must meet the standards for a valid sample set out in Sections 23.4.4.a of this Schedule 17 (but only with respect to establishing the initial existence of a condition) and 23.4.4.b.ii of this Schedule 17.

During the Department's sampling process, the Department shall in all cases provide Developer an opportunity to collect split samples upon written request by Developer provided a reasonable period of time in advance of such sampling.

23.4.5. If the conditions in either Section 23.4.4.b.i.A or Section 23.4.4.b.i.B of this Schedule 17 have been satisfied as confirmed by at least an initial Department sample collected pursuant to Section 23.4.4.c.i of this Schedule 17, such Unexpected Groundwater Contamination Condition shall be considered to exist and be continuing from the date on which Developer first collected the effluent sampling that was the basis for the results referenced in Section 23.4.4.a. of this Schedule 17 to, and ending on, the earlier of:

a. the date of the second consecutive sample collected pursuant to Section 23.4.4.c.ii of this Schedule 17 that fails to demonstrates the satisfaction of either the condition set out in

Section 23.4.4.b.i.A or the condition set out in Section 23.4.4.b.i.B (other than due to a failure to meet the standard for a valid sample set out in Section 23.4.4.b.ii of this Schedule 17); and

b. the date of the first sample collected pursuant to Section 23.4.4.c.ii of this Schedule 17 that fails to meet the standard for a valid sample set out in Section 23.4.4.b.ii of this Schedule 17.

23.4.6. If, as a result of such sample collection and analysis, no Unexpected Groundwater Contamination Event is found to have occurred, the Developer shall reimburse the Department for all costs and expenses incurred by the Department in performing sample collection and analysis pursuant to Section 23.4.4.c of this Schedule 17, provided that the Department may at any time, in its discretion, delegate the performance of all or any such activities to the Developer.

23.5. Coordination with Governmental Authorities

23.5.1. State and Federally regulated facilities (e.g., sites listed on the National Priorities List, or otherwise under EPA order or agreement, leaking underground storage tanks, and other facilities under State or Federal regulatory jurisdiction) are located within the Project. The Developer is responsible for any notification and coordination with appropriate Governmental Authorities, including CDPHE, EPA, CCD Department of Environmental Health, Colorado Department of Labor and Employment, Division of Oil and Public Safety, Colorado Division of Water Resources, and Tri-County Health Department and for obtaining any Governmental Approvals and Permits required for the management and/or disposal of RHMs within or associated with such facilities.

23.5.2. The Department shall be invited to all meetings with and copied in all communications to Government Authorities regarding the management or disposal of RHMs associated with the Project.

23.6. Generator Status and Hazardous Substance Liability and Cost Recovery

23.6.1. As between the Department and the Developer:

a. the Developer shall be deemed the sole generator under 40 C.F.R. Part 262 and the arranger under CERCLA Section 107(a) with respect to any Developer Release of Hazardous Substances; and

b. the Department shall be deemed the sole generator under 40 C.F.R. Part 262 and the arranger under CERCLA Section 107(a) with respect to any Hazardous Substances for which the Developer is not identified as the generator and arranger pursuant to Section 23.6.1.a of this Schedule 17; provided that, to the extent that the Developer fails to utilize disposal sites or transporters of such Hazardous Substances in accordance with the MMP, or to otherwise follow the requirements of the MMP pursuant to Section 23.8.2 of this Schedule 17 necessary to preserve the Department's generator and arranger status, the Developer shall be deemed to be the generator and arranger of such Hazardous Materials, notwithstanding this Section 23.6.1.b.

23.6.2. Notwithstanding Section 23.6.1 of this Schedule 17, and subject always to the Developer's rights arising as a result of the occurrence of a Supervening Event or of any Developer Change documented in a Change Order, and to the Enterprises' responsibilities under Section 23.6.1.b of this Schedule 17, the Developer shall remain responsible for:

a. RHM manifests (including generator signature only to the extent of the Developer's responsibilities under Section 23.6.1.a of this Schedule 17), transport, recordkeeping, handling and remediation pursuant to this Agreement, including Section 23.1.2 of this Schedule 17 and the MMP; and

b. complying with all Environmental Requirements, including provisions set out in the BRMMP and in each of the MMP, SAP, HASP, CDOT's *Procedures for Hazardous Materials Spills That Occur on State and Federal Highways Within Colorado as a Result of a Highway Transportation Incident* for traffic incidents and the SPCC Plan, including in

each case by maintaining documentation of all pertinent certifications required thereunder for all Subcontractors (which certifications shall be made available to the Department upon request).

23.6.3. To the extent the Department:

a. assumes responsibility, in whole or in part, for the identification, management, removal and/or disposal of RHMs pursuant to Section 23.1.3 of this Schedule 17; or

b. is otherwise liable for costs associated with RHMs in connection with a Supervening Event in accordance with Section 15 of the Project Agreement,

the Department may take such actions necessary to preserve its claims against other potentially responsible parties for any such costs, including actions necessary to assure that any such costs are directly or indirectly incurred by the Department consistent with the National Contingency Plan, 40 C.F.R. Part 300, provided such actions do not adversely affect the Project Schedule or increase Developer's costs or liability (except to the extent such adverse effects, costs or liability are taken into account in connection with the resolution of such Supervening Event).

23.7. Traffic Incident and Construction-related Spills

The Developer shall comply with:

a. the CDOT *Procedures for Hazardous Materials Spills that Occur on State and Federal Highways Within Colorado as a Result of a Highway Transportation Incident* with respect to spills resulting from vehicle traffic incidents; and

b. the SPCC Plan with respect to construction-related spills.

23.8. Materials Management Plan

23.8.1. The Developer shall prepare, implement and comply with a Materials Management Plan ("MMP") for applicable handling, storage and suitable disposal of RHMs during the Term. The MMP shall be written to assure compliance with all Environment Requirements and shall incorporate the Beneficial Reuse and Materials Management Plan provided in the Reference Documents (the "BRMMP"). Any changes proposed to the BRMMP (as it is incorporated in the MMP) shall, to the extent initiated by the Developer and not made as a result of any Change made pursuant to Schedule 24 (*Change Procedure*) and documented in a Change Order or a Directive Letter, be submitted to the Department for Approval in advance and shall also require subsequent approval by CDPHE. All RHMs shall be tracked from identification to final disposition. Subject to Section 23.1.3 of this Schedule 17, the Developer shall identify, manage, remove and dispose of RHMs in accordance with Section 23.1.2 of this Schedule 17. Notwithstanding any standards for reuse of soils set forth in BRMMP, the MMP shall not allow the reuse of any soils contaminated with concentrations of chemical constituents above standards for unrestricted reuse (as defined in the BRMMP) in any portion of the Site located west of Colorado Boulevard.

23.8.2. The MMP shall identify potential RHMs, their locations (including locations of RHMs on plan sheets), the extent of impact, proposed corrective actions, waste management procedures, avoidance measures, investigation measures, and a contingency plan for addressing unforeseen conditions. In addition, the MMP shall define the method for abating RHMs (e.g., lead-based paint, lead-containing paint, asbestos and universal wastes) in structures. The plan shall outline the approach to implementing the MMP and identify the qualifications of personnel required to perform activities required under the plan and shall incorporate the information regarding RHMs in structures documented in the SSAR's prepared under Section 23.13 of this Schedule 17. In addition to meeting the requirements of Section 250, the MMP shall demonstrate that the Developer shall manage all RHMs, including soils, groundwater, surface water, and other contaminated substances, in a manner to prevent exposure to proposed Project personnel, the public, the Environment and Improvements, to prevent any contamination of non-contaminated areas, and in compliance with the Environmental Requirements. The Department shall:

a. be responsible for designating off-Site disposal sites for RHMs that are to be removed from the Site (except in respect of RHMs that are the subject of a Developer Release of Hazardous Substances, in relation to which the Developer shall be so responsible);

b. provide a list of such sites Developer may use for disposal or treatment of, and of transporters the Developer may use for transport for disposal or treatment of, such RHMs, which list shall be incorporated into the MMP; and

c. provide for execution by Department representatives of, or provide appropriate authorization to Developer to act as the Department's agent with respect to execution of, manifests and other documentation as necessary to maintain the Department's status as sole generator and arranger with respect to such RHMs pursuant to Section 23.6.1 of this Schedule 17.

Once disposal sites are located and selected (whether by the Department or, with respect to Developer Releases of Hazardous Substances, by the Developer), the Developer shall ensure that all requirements of the transporter and the receiving disposal facility and all Environmental Requirements are complied with and are properly documented.

23.8.3. In the MMP, the Developer shall provide provisions to characterize and classify RHM into categories as appropriate for the Project, including:

a. Solid waste (hazardous and non-hazardous as defined under the RCRA) requiring off-Site disposal and/or treatment;

b. Contaminated soils requiring off-Site disposal;

c. Soils to be stockpiled for further characterization;

d. Soils with concentrations of waste constituents below regulatory action levels set forth in the BRMMP that can be reused with or without restriction;

e. Soils that can be reused for CCD projects in accordance with Section 4D of the Denver IGA and the Guidance for Central 70 Project Reuse of Excess Soil on City and County of Denver Owned Properties as provided in the Reference Documents;

f. Wastewater requiring off-Site disposal and/or treatment;

g. Impacted water to be held for further characterization;

h. ACM discovered during construction or demolition;

i. Lead-based paint associated with structures, signage, light posts, etc;

j. Waste material to be contained for further characterization;

k. Contaminated groundwater requiring on-site treatment or off-Site disposal;

l. Circumstances in which a separate comprehensive plan for the long-term cleanup and monitoring of RHMs may be required in accordance with Section 23.9.1 of this Schedule 17;

m. Identification of the location and method selected for any treatment or disposal of RHMs pursuant to this Schedule 17; and

n. Conditions requiring Developer personnel to call the MT to screen for RHM.

23.8.4. The MMP shall include a standard template to be used for the Monthly Statement of Recognized Hazardous Materials Management (see Section 23.15 of this Schedule 17) and the Recognized Hazardous Materials Management Completion Report (see Section 23.16 of this Schedule 17). These reports shall include a narrative description of all RHM-related activities conducted by the Developer (excluding those items for which the Department has retained responsibility under Section 23.1.3 of this Schedule 17) and tracking of all such RHMs including their point of origination, remediation activities, location of disposal (on or off-Site) and completed waste profiles, manifest forms, and bill-of-lading forms for proper transportation and disposal of

materials off-Site, including the items required in Section 5 (Reporting) of the BRMMP. The work to complete the Monthly Statement of Recognized Hazardous Materials Management and the Recognized Hazardous Materials Management Completion Report shall be considered incidental and therefore shall not be included in any Supervening Event Submission. This information shall be available at all times for review by the Department. Without limiting the foregoing, the following information shall be included for all RHMs (e.g., soil, groundwater):

a. GPS or survey information mapped on plan sheets identifying the point of origination of the RHM, the applicable vertical horizon (as defined in the BRMMP) and all sampling locations;

b. Field screening/monitoring results;

c. Laboratory analytical results;

d. Disposition including temporary stockpiling, use on-site, use off-Site, disposal, etc.;

e. GPS, survey, or other locational data that meets the requirements of the BRMMP and is mapped on plan sheets showing the location of soils contaminated with Hazardous Substances above RSL-R's that have in been reused on site in accordance with the BRMMP;

f. Management practices;

g. Transportation methods;

h. Disposal information, including manifests (hazardous and non-hazardous);

i. Permits or Governmental Approvals;

j. Required submittals to Governmental Authorities, Railroads and Utility Owners for Permits and Government Approvals;

k. Import material source and sampling documentation;

l. HSO daily diary, as required in Section 250;

m. In the Monthly Statement of Recognized Hazardous Materials Management, the identification of any separate comprehensive plans for the long-term cleanup and monitoring of RHMs submitted for Acceptance in accordance with Section 23.9.1 of this Schedule 17 during the preceding month or under which response actions are being conducted during such month, and

n. In the Recognized Hazardous Materials Management Completion Report, identification of all separate comprehensive plans for the long-term cleanup and monitoring of RHMs under which such RHMs were addressed

23.8.5. The MMP shall be submitted for Approval by the Department prior to issuance of NTP2.

23.8.6. The Developer is responsible for all requirements associated with development and implementation (including administration, monitoring, sampling and reporting) of the MMP.

23.9. Long-Term Clean Up Plans

23.9.1. To the extent that the MMP (as amended and supplemented from time to time) does not address long-term cleanup and/or monitoring of any RHMs for which the Developer is responsible, the Developer shall develop and submit to the Department for Acceptance a comprehensive plan (including a completion schedule) for the long-term cleanup and monitoring of such RHMs through the end of the Operating Period.

23.9.2. Upon Acceptance of such a comprehensive plan, the Developer shall be responsible for completing any and all remediation, monitoring and/or related responsibilities related to the relevant RHMs in compliance with such plan through the end of the Operating Period.

23.10. Sampling and Analysis Plan

23.10.1. The Developer shall prepare a Sampling and Analysis Plan ("SAP") to identify and characterize potential RHMs that may be encountered during the Term, and to outline processes for monitoring/screening of RHM for storage, handling, and disposal during the Term. In addition to complying with Section 250, the SAP shall include, at a minimum:

a. Data quality objectives;

b. Sample collection procedures for all RHMs (e.g., soil, water, asbestos, paint, universal wastes), including field screening, borehole drilling, monitoring well construction, soil sampling and/or groundwater sampling methods, and decontamination;

c. Quality control;

d. Field equipment calibration procedures/frequency;

e. Quality assurance objectives (data); and

f. Provisions for corrective action, if needed.

23.10.2. The SAP shall be submitted for Approval by the Department prior to issuance of NTP2.

23.11. Health and Safety Plan

23.11.1. The Developer shall designate a Health and Safety Officer (HSO) to prepare and implement a Health and Safety Plan ("HASP") in compliance with 29 C.F.R. Parts 1910 and 1926. Since RHMs have been identified within the Right-of-Way, the HASP shall comply with the requirements of 29 C.F.R. § 1910.120 or 29 C.F.R. § 1926.65, paragraph (b)(4). The Developer shall in the HASP furnish documentation to the Department that the requirements for the HSO specified in Section 23.21.2 of this Schedule 17 have been met. The HASP shall be submitted to the Department for Acceptance and distributed to all employees who are required pursuant to Law to have access to the HASP. The HASP shall be displayed or made available on-site at all times. The Developer shall develop and maintain on-site all industrial hygiene information, including "right-to-know" information. In addition to meeting the requirements of Section 250, the Developer shall maintain documentation and promptly provide information to the Department, as requested, regarding potential or actual exposure to workers and/or the public. The Developer shall maintain records of all related incidents and notify the Department and appropriate Governmental Authorities immediately. The HASP shall be considered a "living document" and, as such, be amended as construction and operation of the Project progresses during the Term. The HSO who prepares and implements the HASP shall at all times meet the requirements specified in Section 23.21.2 of this Schedule 17.

23.11.2. Due to the presence of solid waste landfills with the potential for asbestos containing building materials, all workers involved in soil disturbing activities shall complete the 2-Hour Asbestos Awareness Training in accordance with OSHA and 29 C.F.R. § 1926.1101. The Developer shall be responsible for completing and documenting OSHA training and implementing OSHA requirements for the Work.

23.11.3. The HASP shall be submitted for Acceptance by the Department prior to issuance of NTP2.

23.12. Spill Prevention Control Countermeasure Plan

23.12.1. The Developer shall prepare a SPCC Plan for Acceptance by the Department according to 40 C.F.R. Part 112, and Section 208.06 to this Schedule 17. The SPCC Plan shall be considered a "living document" and, as such, be amended as construction and operation of the Project progresses during the Term.

23.12.2. The SPCC Plan shall be submitted for Acceptance by the Department prior to issuance of NTP2.

23.13. Structure Surveys

23.13.1. Asbestos containing building materials ("ACBM"s), lead-containing paint ("LCP"), lead-based paint ("LBP"), and universal wastes or regulated materials that could not be disposed at a Subtitle

D landfill (e.g., Hazardous Waste as defined by the Resource Conservation and Recovery Act; Universal Wastes as defined by the EPA and 6 CCR Part 273 of the Colorado Hazardous Waste Regulations; chlorofluorocarbons as defined by the Clean Air Act; and polychlorinated biphenyls as defined by the Toxic Substances Control Act) may be present on various components of the Project (e.g., residential and commercial building improvements, bridge girders, railings, light poles, abutments). Prior to performing any demolition or rehabilitation activities on any part of the Site of any structures, bridges, removal of Utility Service Lines or any other features that may contain these materials, the Developer shall submit to the Department for Acceptance a Site-wide Structure Survey Assessment Plan ("SSAP"). The SSAP shall be developed in accordance with Section 250.04, CDPHE Air Pollution Control Commission's Regulation 8 Part B, OSHA and other requirements of Environmental Law. The SSAP shall define the Developer's approach and methodology for completing the survey to document the presence of ACBMs, LBP, LCP, universal waste and regulated materials. In addition, the SSAP shall define the required qualifications for personnel who will implement the assessment plan including the Certified Asbestos Building Inspector. The Developer shall implement the SSAP prior to conducting any Work that could disturb ACBMs, LBP, LCP, universal waste and regulated materials.

23.13.2. Upon completion of each structure survey, and prior to the initiation of abatement or demolition activities, the Developer shall submit to the Department for Acceptance a Structure Survey Assessment Report ("SSAR") in respect of each survey that was completed (e.g., one report for each parcel or bridge). Each SSAR shall detail the methodology, results and conclusions of the relevant survey, including the abatement requirements, and at a minimum shall contain:

a. Tables summarizing the quantitates, friability and locations of ACBM; materials that do not contain asbestos; OSHA-regulated materials (from trace amounts up to one percent asbestos-containing materials); LBP and LCP quantities and locations and locations and quantities of universal waste or regulated materials;

b. Figures depicting the asbestos and paint sampling locations; locations of ACBM and OSHA-regulated materials; locations of LBP and LCP; and locations of universal waste or regulated materials; and

c. Appropriate supporting materials such as photographic logs, scaled drawings, laboratory reports, and personnel and laboratory accreditations.

23.13.3. The Developer is responsible for the development of the SSAP, completion of the survey and development of the SSAR. These activities shall be considered incidental and therefore shall not be included in any Supervening Event Submission.

23.13.4. Subject to Section 23.1.3 of this Schedule 17 and Section 2 of Schedule 18 (*Right-of-Way*), the Developer shall, in accordance with the Environmental Requirements, properly remove, abate, segregate according to disposal requirements, and dispose of all waste generated as part of demolition of any buildings or other structures in accordance with Environmental Law. All abatement of ACBM shall be completed by a Certified General Abatement Contactor.

23.13.5. The Developer shall avoid sanding, cutting, burning, or otherwise causing the release of lead from paint on selected painted components. OSHA Regulation 1926.62 (29 C.F.R. § 1926.62) shall be consulted for worker protection prior to removal of painted components.

23.13.6. If painted metal components are to be removed and recycled, they must be recycled in accordance with Section 250.04. The recycling facility shall be notified of the potential presence of LCP/LBP.

23.13.7. The Developer shall comply with all requirements for containing flaked-off paint material and other residue and waste materials that may be generated during removal and transportation of painted structures, including wastewater from power washing operations. At no time will wastewater from power washing operations be allowed to discharge to the surface or any water body. Any encapsulate used to treat the lead-based paint shall render the coated paint non-leachable by not exceeding the threshold of 5 milligrams per liter as confirmed by the Toxicity Characteristic Leaching Procedure ("TCLP") for lead.

23.13.8. The Developer shall be responsible for the removal and disposal of OSHA-regulated materials as identified in 29 C.F.R. § 1926.1101. These activities shall be considered incidental and therefore shall not be included in any Supervening Event Submission.

23.13.9. Within 30 Calendar Days of completion of abatement activities the Developer shall submit to the Department for Acceptance a Structure Survey Completion Report (SSCR) for each parcel or structure (e.g., one report for each parcel or bridge). The SSCR shall include documentation detailing what abatement was completed including material types and quantities, clearance tests, disposal manifests for all material that was disposed at a permitted facility and any other relevant documentation.

23.14. Asbestos in Soils

A number of solid waste landfills, which have the potential to contain asbestos containing building materials, were identified at the Right-of-Way in the EIS. In addition, when any discarded material is encountered that contains or consists of any of the following: construction, renovation and demolition debris (regardless of how it was generated), building or facility components, components of building systems (HVAC, plumbing, electrical, control, fire protection, roofing), components of pavement or drainage systems, industrial or machinery components, and/or mechanical components from motorized vehicles, or where asbestos-contaminated soil is discovered, the Developer shall conduct inspections and/or abatement in accordance with CDPHE Section 5.5 of the Solid Waste Regulations, CDOT Regulated Asbestos Contaminated Soil Management Standard Operating Procedure (provided in the Reference Documents), Section 250, and relevant OSHA, and other Environmental Requirements. For certainty, the document CDOT Regulated Asbestos Contaminated Soil Management Standard Operating Procedure incorporates current CDPHE guidance, and as such shall take precedence over Section 250 if the two documents conflict.

23.15. Monthly Statement of Recognized Hazardous Materials Management

The Developer shall submit Monthly Statements of Recognized Hazardous Materials Management to the Department for Acceptance summarizing all Developer activities associated with the management, removal and disposal of RHMs during the Construction Period, including applicable documentation from the Health and Safety Officer's daily diary as required in Section 250. The reports shall include the requirements in Section 23.8.4 of this Schedule 17 and the reporting requirements included in Section 5 (Reporting) of the BRMMP. During the Operating Period, the Monthly Statement of Recognized Hazardous Materials Management shall be submitted monthly, but only if RHMs were handled during that month. After CDOT's Acceptance each submittal shall be submitted to CDPHE for review.

23.16. Recognized Hazardous Materials Management Completion Report and Environmental Covenant/Notice of Environmental Use Restriction

Within 60 Calendar Days following Substantial Completion, the Developer shall submit a Recognized Hazardous Materials Management Completion Report for Approval documenting how the MMP, BRMMP, and any plans prepared pursuant to Section 23.9 of this Schedule 17 were implemented and detailing how RHMs were identified, handled and disposed by the Developer. Such Report shall also include all necessary information for the Department to record an environmental covenant or notice of environmental use restriction against the Site pursuant to the requirements of the BRMMP and plan sheets mapping the location of soils contaminated with Hazardous Substances above the RSL-R's (as defined in the BRMMP) reused within the Site. For certainty, the Developer's coordination with the Department and CDPHE on the preparation and submittal of all required documents to record an environmental covenant or notice of environmental use restriction is a condition for the Approval of the Recognized Hazardous Materials Management Completion Report. For clarity, the recording of any such environmental covenant or notice of environmental use restriction is considered a Governmental Approval for which the Developer is responsible under this Agreement.

23.17. Unexpected Hazardous Substances

23.17.1. In the event that any Unexpected Hazardous Substances are encountered or discovered, the Developer shall submit a remedial plan as part of any Detailed Supervening Event Submission. The remedial plan shall describe the Developer's approach including a sampling plan; means and methods of management, and the disposal facility; the required personnel for remediating the Unexpected Hazardous Substance; the estimated cost of implementing the remedial plan; and the required coordination with Governmental Authorities and associated Governmental Approvals and Permits. The remedial plan shall be subject to Department Acceptance and may, upon such Acceptance, be used to satisfy the Developer's applicable obligations under Section 23.9 of this Schedule 17. For certainty, the Department's Acceptance of a remedial plan shall not in any way bind or commit the Department with respect to the subject matter of the Detailed Supervening Event Submission.

23.17.2. Any Supervening Event Submission made with respect to any Unexpected Hazardous Substances Event shall be made pursuant to Section 15.1.2 of the Project Agreement and shall be subject to Developer, on and prior to the date of such submission, having complied with the remedial plan Accepted by the Department pursuant to Section 23.17.1 of this Schedule 17 in all material respects.

23.17.3. Notwithstanding the foregoing, for certainty, the Developer shall at all times be responsible for the field monitoring, sampling, tracking, and reporting of RHMs. These activities shall be considered incidental and therefore shall not be included in any remedial plan or Supervening Event Submission, whether or not such RHMs are considered Unexpected Hazardous Substances.

23.18. Residential Properties Sampling Plan

To document that adjacent residential properties are not re-contaminated with heavy metals due to construction activities, the Developer shall prepare and implement a Residential Properties Sampling Plan that outlines the procedures for pre, during and post-construction lead and arsenic sampling at four residential properties. The Developer shall identify the properties to be sampled in coordination with the USEPA, obtain permission to complete the sampling from the property owner, and shall submit the plan to the Department for Acceptance and USEPA and the CCOD for approval prior to issuance of NTP2.

23.19. Import Materials

23.19.1. For each source of imported fill material, the Developer shall obtain the Department's Acceptance prior to bringing the material on site and the identification of, and the screening and sampling for, the following constituents shall be considered incidental and therefore shall not be included in any Supervening Event Submission, provided that any such Acceptance shall not, for certainty, constitute an Acceptance of any resulting Developer Release of Hazardous Substances. The Developer is responsible for the sampling and testing of import materials and shall test the material at a minimum frequency of one sample for every 2,000 cubic yards from each source area for the following constituents:

a. Volatile organic compounds (EPA Method 8260b);

b. Semi-volatile organic compounds (EPA Method 8270);

c. Total petroleum hydrocarbons (EPA Method 8015);

d. RCRA 8 metals (EPA Method 6010 and 7471);

e. Pesticides (EPA Method 8081);

f. Polychlorinated biphenyls (EPA Method 8082); and

g. Asbestos (PLM).

23.20. Other Requirements

23.20.1. The Developer is responsible for any reporting or notification with respect to RHMs required by Governmental Authorities, including CDPHE, EPA, CCD Department of Environmental Health, Colorado Department of Labor and Employment, Division of Oil and Public Safety, and Tri-County Health Department.

23.20.2. The Developer is responsible for contacting the Colorado Division of Water Resources, CDPHE or the Colorado Department of Labor and Employment, Division of Oil and Public Safety, if groundwater monitoring or supply wells will be disturbed by the Construction Work in order to determine the status and any requirements for well protection, replacement or abandonment. Non-operational monitoring and supply wells shall be abandoned in accordance with Colorado Division of Water Resources well-abandonment requirements. The discovery of and abandonment or replacement (at the existing or new location) of a well is considered incidental and therefore shall not be included in any Supervening Event Submission.

23.20.3. The Developer shall conduct a preliminary survey of any private property or buildings that may be affected by dewatering to establish existing conditions and then shall monitor roadways for any settlement caused by dewatering. The Developer shall repair any damage to roadways, private property, or buildings caused by dewatering operations.

23.20.4. Except as provided otherwise in this Agreement (including in this Schedule 17), the Developer shall be responsible for all removal or management of RHMs encountered or discovered, and any backfill screening and placement required, in connection with Utility Work conducted pursuant to any URA or with another part of the Work conducted in connection with any other access or use agreement with a Utility Owner.

23.21. Required Personnel

23.21.1. The Developer shall designate a RHM Manager from the Agreement Date to the end of the Construction Period who has at least 10 years of experience managing RHMs and who shall report to the EM. The individual who is the RHM Manager can also fill the role of the Compliance Manager (during the Construction and Operating Periods, as applicable), defined in the BRMMP, if the individual satisfies both the RHM Manager and Compliance Manager qualifications. The RHM Manager is responsible for:

a. Implementing the MMP;

b. Ensuring the Developer follows all Environmental Requirements applicable to RHM:

c. Leading bi-weekly (every two weeks) meetings with the Department to review the status of RHMs; and,

d. Notifying the Department in writing within 8 hours of any encountering or discovery of RHM (including Releases thereof) affecting the Site or the Work.

23.21.2. The Developer shall designate a Health and Safety Officer ("HSO") in accordance with the requirements below and shall staff such position from the Agreement Date to the end of the Term. The HSO who prepares and implements the HASP shall possess the following minimum qualifications:

a. Be a Certified Industrial Hygienist;

b. Completed OSHA training in accordance with 29 C.F.R. § 1910.120(e) including 40-hour (§ 1910.120(e)(3)(i)) and management and supervisor training (§ 1910.120(e)(4);

c. Completed the minimum training and medical surveillance requirements established by the Occupational Safety and Health Administration (OSHA) and the Environmental Protection Agency (EPA) for a supervisory Site Safety Official per 29 C.F.R. § 1962.65;

d. Completed training and certification in accordance with the Air Quality Control Commission Regulation No. 8 Part B (State and EPA-Certified Asbestos Building Inspector ("CABI"));

e. Have a thorough knowledge of all applicable OSHA, EPA, State, and local regulations as they pertain to the protection of the environment and the safety and health of the workers and public; and

f. Have at least 10-years of experience working on and developing health and safety programs for projects that require the handling, treatment, storage and disposal of RHMs.

23.21.3. In addition, in accordance with Section 250.03(b) of this Schedule 17, the Developer shall designate a Monitoring Technician(s) ("MT") who has completed the 40 hour HAZWOPER and eight hour OSHA Supervisory training. The MT shall be responsible for the identification and monitoring of Hazardous Substances during the Term. The MT shall also be a State and EPA-CABI and meet the requirements of a Qualified Project Monitor as defined in the Colorado Solid Waste Regulation Section 5.5.3 and shall meet the requirements outlined in the MMP. In accordance with the BRMMP, the MT is required to be on-site during all soil-disturbing activities west of Colorado Boulevard. East of Colorado Boulevard, the MT is not required to be onsite at each soil disturbing face if the BRMMP Compliance Manager (CM) determines no impacted materials will likely be encountered; if impacted materials are encountered during construction, work shall stop until a CM or MT is onsite to complete the appropriate screening and sampling in accordance with the BRMMP. The designated MT can delegate activities to other MTs, who meet the qualifications of the MT.

23.21.4. The Developer shall certify that the procedures, health and safety precautions, and methods described in the MMP, SAP and HASP are in accordance with the OSHA, CDPHE, OPS and EPA standards and all other Environmental Requirements.

24. ENERGY

The Developer shall implement the energy mitigation measures referenced in the ROD to the fullest extent practicable. The Developer shall submit an update quarterly as part of the ECWP update which documents the Developer's procedures and programs to save energy.

25. DELIVERABLES

At a minimum, the Developer shall submit the following Deliverables to the Department for Information, Acceptance, or Approval in accordance with the specified timeframes:

Table 17-5 Deliverables

Deliverable	Information, Acceptance or Approval	Schedule
Environmental Compliance Work Plan ("ECWP")	Approval (or Acceptance, but only with respect to any discipline specific management plan incorporated therein that requires Acceptance and not Approval in accordance with this Table 17-5)	Prior to issuance of NTP2 and annually thereafter in accordance with Section 2.1.3 of this Schedule 17
Environmental Status Report ("ESR")	Acceptance	10 Working Days following the end of the reporting period (monthly during the Construction Periods; quarterly during the Operating Period)
Mitigation Completion Report	Acceptance	Prior to Final Acceptance
Environmental Compliance and Mitigation Training Program	Acceptance	Prior to issuance of NTP2

Deliverable	Information, Acceptance or Approval	Schedule
Environmental Compliance and Mitigation Training Program Annual Update and Report	Acceptance	Annually, 30 Calendar Days after the end of the Contract Year
Air Quality Monitoring, Maintenance, and Mitigation Plan ("AQ3MP")	Acceptance	Prior to issuance of NTP2, updated annually
Proposed Locations of PM-10 Monitors	Acceptance	Two weeks prior to operating the monitor
Environmental Approvals (all)	Information	Per the requirements of Environmental Law and this Agreement
Migratory Bird Nest Survey	Information	Prior to impacting existing structures or vegetation that may contain active bird nests and prior to specific activities (e.g., clearing), consistent with CDOT and CPW guidance and policy
Preliminary Noise Technical Reports	Acceptance	Prior to conducting Benefited Receptor Preference Survey
Benefited Receptor Preference Survey supporting material	Approval	14 Calendar Days prior to conducting Benefited Receptor Preference Survey
Final Noise Technical Reports	Acceptance	Prior to issuance of RFC Documents and at the time of any update required pursuant to Section 11.3.5 of this Schedule 17
Construction Noise Mitigation and Monitoring Plan ("CNMMP")	Acceptance	Prior to issuance of NTP2, updated annually
Paleontological Annual Reports	Acceptance	Annually, 60 Calendar Days after the end of the reporting period
Paleontological Summary Report	Acceptance	60 Calendar Days after earthwork is completed
SB 40 Certification Application Package	Approval	Prior to construction work in SB 40 area
Integrated Noxious Weed Management Plan ("INWMP")	Acceptance	Prior to issuance of NTP2, updated annually
Wetland Finding Report (if required)	Approval	Prior to impacting wetlands
BTPD Management Plan	Acceptance	Prior to impacting BTPD

Deliverable	Information, Acceptance or Approval	Schedule
Materials Management Plan ("MMP"), including any changes relative to the Beneficial Reuse and Materials Management Plan ("BRMMP")	Approval	Prior to issuance of NTP2, updated annually
Long-Term Clean Up Plan(s)	Acceptance	As and when required pursuant to Section 23.9 of this Schedule 17
Sampling and Analysis Plan ("SAP")	Approval	Prior to issuance of NTP2, updated annually
Residential Soils Sampling Plan	Acceptance	Prior to issuance of NTP2, updated annually
Health and Safety Plan ("HASP")	Acceptance	Prior to issuance of NTP2, updated annually
Spill Prevention Control and Countermeasures Plan ("SPCC Plan")	Acceptance	Prior to issuance of NTP2, updated annually
Structure Survey Assessment Plan ("SSAP") (Project-wide document)	Acceptance	Prior to the demolition of any structure or other relevant components of the Project
Structure Survey Assessment Report ("SSAR") (per parcel or structure)	Acceptance	Prior to the demolition of any structure
Structure Survey Completion Report ("SSCR") (per parcel or structure)	Acceptance	Within 30 Calendar Days after completion of abatement activities.
Import Materials Documentation	Acceptance	Prior to bringing the materials onto the Site
Remedial Plan	Acceptance	As part of Schedule 21 (*Form of Supervening Event Submission*)
Environmental Approval	Approval	Prior to conducting Work where an Environmental Approval is required, including any Work that has not been approved in the ROD
Monthly Statement of Recognized Hazardous Materials Management	Acceptance	10 Working Days after the end of each month as per Section 23.15 of this Schedule 17, followed by submittal to CDPHE
Recognized Hazardous Materials Management Completion Report	Approval	60 Calendar Days after Substantial Completion
Schedule of Planned Noxious Weed Management Activities	Information	Monthly, five Calendar Days prior to the beginning of each month (March through October)

Deliverable	Information, Acceptance or Approval	Schedule
Noxious Weed Survey and Summary of Treatment Activities Report	Acceptance	Monthly, within 10 Working Days of the end of each month (March through October) during the Construction Period. Three times per year during the Operating Period.
Protected Environmental Resources shown in all Plan Sets	Acceptance	To be included with each plan set submittal
Asbestos, Lead-Based Paint and Regulated Materials Survey Report	Acceptance	15 Working Days prior to demolition
Dewatering or Remediation Plan	Acceptance	Prior to discharge as required by the permit
Summary Report of IQC Water Quality Documentation Audit	Information	Monthly, within 7 Calendar Days of the end of the month.
Diesel Nonroad Construction Equipment ("DNRCE") Report	Information	Quarterly, within 10 Working Days of the end of the reporting period.
BTPD Management Plan	Acceptance	Prior to conducting activities that could potentially impact BTPD, updated annually.
Level II Historic Archival Photographs and Measured Drawings (One submission per resource)	Acceptance	10 Working Days prior to demolition or construction activities on affected parcels.
Level II Historic Documentation for Submittal to SHPO (One submission per resource)	Acceptance	Within 6 months of demolition of the resource.

26. APPENDICES

Appendix A Project Special Provisions
Appendix B Known Hazardous Substances Parcels
Appendix C Groundwater Benchmark Concentrations

Appendix A
Project Special Provisions

The following specifications modify and take precedence over the Standard Specifications. The requirements of Schedule 10A (*Applicable Standards and Specifications*) apply to these Project Special Provisions.

PROJECT SPECIAL PROVISIONS

	Pages
Index	17-40
Revision of Section 208 – Erosion Control	17-41 to 17-65
Revision of Section 240 – Protection of Migratory Birds Biological Work Performed by the Contractor's Biologist	17-66 to 17-68
Revision of Section 250 – Environmental, Health, and Safety Management	17-69 to 17-81

REVISION OF SECTION 208
EROSION CONTROL

Section 208 is hereby deleted from the Standard Specifications for this project and replaced with the following:

DESCRIPTION

208.01 This work consists of constructing, installing, maintaining, and removing when required, Best Management Practices (BMPs) during the life of the Contract, including the period during which final stabilization is achieved, to prevent or minimize erosion, sedimentation, and pollution of any State waters as defined in subsection 107.25, including wetlands.

The Contractor shall coordinate the construction of temporary BMPs with the construction of permanent BMPs to assure effective and continuous erosion and sediment control throughout the Construction Period.

When a condition of this Project Special Provision 208 or a Noncompliance Notice or Noncompliance Report by the Department or the Contractor requires that an action be immediate or taken immediately, it shall be understood that the Contractor shall at once begin effecting completion of the action and pursue it to completion in a manner acceptable to the Department, and in accordance with the Colorado Discharge Permit System Stormwater Construction Permit (CDPS-SCP) requirements.

MATERIALS

208.02 Erosion control materials are subject to acceptance in accordance with subsection 106.01. The IQC program shall verify and document that erosion control materials installed on Site have met the required acceptance criteria, including Certificates of Compliance (COC) and are on the Approved Products List (APL). Erosion control materials shall be subject to the following approval process:

Material	Approval Process	Notes:
Erosion Bales (Weed Free)	COC	The Contractor shall provide a transit certificate number or a copy of the transit certificate as supplied from the producer.
Silt Fence	COC	
Silt Berm	APL	
Erosion Log (Type 1 and 2)	COC	
Silt Dikes	COC	
Pre-fabricated Concrete Washout Structures (above ground)	APL	
Pre-fabricated Vehicle Tracking Pad	APL	
Aggregate Bag	COC	
Storm Drain Inlet Protection (Type I, II and III)	APL	

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REVISION OF SECTION 208
EROSION CONTROL

The material for BMPs shall conform to the following:

(a) *Erosion Bales.* Material for erosion bales shall consist of Certified Weed Free hay or straw. The hay or straw shall be certified under the Colorado Department of Agriculture Weed Free Forage Certification Program and inspected as regulated by the Weed Free Forage Act, Title 35, Article 27.5, CRS. Each certified weed free erosion bale shall be identified by blue and orange twine binding the bales.

The Contractor shall not place certified weed free erosion bales or remove their identifying twine until the IQC has inspected and accepted them.

The Contractor may obtain a current list of Colorado Weed Free Forage Crop Producers who have completed certification by contacting the Colorado Department of Agriculture, Weed Free Forage Program, 305 Interlocken Pkwy, Broomfield, CO 80021, Contact: Weed Free Forage Coordinator at (303) 869-9038. Also available at www.colorado.gov/ag/csd.

Bales shall be approximately 5 cubic feet of material and weigh at least 35 pounds. Stakes shall be wood and shall be 2 inch by 2 inch nominal.

(b) *Silt Fence*. Silt fence posts shall be wood with a minimum length of 42 inches. Wood posts shall be 1.5 inch by 1.5 inch nominal. Geotextile shall be attached to wood posts with three or more staples per post.

Silt fence geotextile shall conform to the following requirements:

Physical Requirements for Silt Fence Geotextiles

Property	Wire Fence Supported Requirements	Self-Supported Requirements Geotextile Elongation <50%	Test Method
Grab Strength, lbs	90 minimum	124 minimum	ASTM D 4632
Permittivity sec-1	0.05	0.05	ASTM D 4491
Ultraviolet Stability	Minimum 70% Strength Retained	Minimum 70% Strength Retained	ASTM D 4355

Silt Fence (Reinforced). Silt fence posts shall be metal "studded tee" T-post with a minimum length of 66 inches. Metal posts shall be “studded tee” with .095 inch minimum wall thickness. Wire fabric reinforcement for the silt fence geotextile shall be a minimum of 14 gauge, with a maximum mesh spacing of 6 inches. Geotextile shall be attached to welded wire fabric with ties or nylon cable

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REVISION OF SECTION 208
EROSION CONTROL

ties 12 inch O.C. at top, mid and bottom wire. Welded wire fabric shall be attached to the post with a minimum three 12 gauge wire ties per post. Vinyl or rubber safety caps shall be installed on all T-post.

(c) *Temporary Berms*. Temporary berms shall be constructed of compacted soil.

(d) *Temporary Slope Drains*. Temporary slope drains shall consist of fiber mats, plastic sheets, stone, concrete or asphalt gutters, half round pipe, metal or plastic pipe, wood flume, flexible rubber or other materials suitable to carry accumulated water down the slopes. Outlet protection riprap shall conform to Section 506. Erosion control geotextile shall be a minimum Class 2, conforming to subsection 712.08.

(e) *Silt Berm.* Silt berm shall consist of an ultraviolet (UV) stabilized high-density polyethylene, shall be triangular in shape, and shall have the following dimensions:

Width	6 – 11 inches
Height	6 – 10 inches
Weight	0.3 – 1.4 lbs./sq. ft.
Percent Open Area	30 – 50%

Securing spikes shall be 10 to12 inch x 0.375 inch diameter (minimum).

(f) *Rock Check Dam*. Rock Check dams shall be constructed of stone. Stone shall meet the requirements of Section 506.

(g) *Sediment* Trap. In constructing an excavated Sediment Trap, excavated soil may be used to construct the dam embankment, provided the soil meets the requirements of subsection 203.03. Outlet protection riprap shall be the size specified in the Contract and shall conform to Section 506. Erosion control geotextile shall be a minimum Class 1, conforming to subsection 712.08.

(h) *Erosion log*. Shall be one of the following types unless otherwise shown on the plans:

(1) Erosion Log (Type 1) shall be curled aspen wood excelsior with a consistent width of fibers evenly distributed throughout the log. The casing shall be seamless, photo-degradable tube netting and shall have minimum dimensions as shown in Table 208-1, based on the diameter of the log called for on the plans. The curled aspen wood excelsior shall be fungus free, resin free, and free of growth or germination inhibiting substances.

(2) Erosion Log (Type 2) shall consist of a blend of 30-40 percent weed free compost and 60-70 percent wood chips. The compost/wood blend material shall pass a 50 mm (2 inch) sieve with a minimum of 70 percent retained on the 9.5 mm (3/8 inch) sieve and comply to subsection 212.02 for the remaining compost physical properties. The compost/wood chip blend may be pneumatically shot into a geotextile cylindrical bag or be pre-manufactured. The geotextile bag shall consist of material with openings of 1/8 to 3/8 inches of HDPE or polypropylene mesh (knitted, not extruded), and contain the compost/wood chip material while not limiting water infiltration.

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REVISION OF SECTION 208
EROSION CONTROL

Erosion log (Type 1 and Type 2) shall have minimum dimensions as shown in Table 208-1, based on the diameter of the log.

Table 208-1
NOMINAL DIMENSIONS OF EROSION LOGS

Diameter Type 1 (Inches)	Diameter Type 2 (Inches)	Length (feet)		Weight (minimum) (pounds/foot)	Stake Dimensions (Inches)
		Min.	Max.		
9	8	10	180	1.6	1.5 by 1.5 (nominal) by 18
12	12	10	180	2.5	1.5 by 1.5(nominal) by 24
20	18	10	100	4.0	2 by 2 (nominal) by 30

Stakes to secure erosion logs shall consist of pinewood or hardwood.

(i) *Silt Dikes*. Silt dikes shall be pre-manufactured triangular shaped urethane foam covered with a woven geotextile fabric. The fabric aprons shall extend a minimum of two feet beyond each side of the triangle.

Each silt dike shall have the following dimensions:

Dimension	Length
Center height	8 to 10 inches
Base 16 to 21 inches	
Section length	3 to 7 feet
Section width including fabric extensions	5.6 feet

Staples shall be 6 gauge and at least 8 inches long.

(j) *Concrete Washout Structure*. The Contractor shall construct a washout structure that will contain washout from concrete placement and construction equipment cleaning operations. Embankment required for the concrete washout structure may be excavated material, provided that this material meets the requirements of Section 203 for embankment.

A pre-fabricated concrete washout structure can be used in lieu of the above specified concrete washout. It shall consist of a watertight container designed to contain liquid and solid waste from concrete washout. It shall not be placed in an area where a spill would reach a surface water or other drainage structure.

(k) *Vehicle Tracking Pad*. Aggregate for the vehicle tracking pad shall be crushed natural aggregate with at least two fractured faces that meets the following gradation requirements:

Sieve size	Percent by weight Passing Square Mesh Sieves
75 mm (3 inch)	100
50 mm (2 inch)	0-25
19.0 mm (¾ inch)	0-15

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Recycled crushed concrete or asphalt shall not be used for vehicle tracking pads.

Erosion Control Geotextile shall be Class 2 and conform to the requirements of subsection 712.08.

Pre-fabricated vehicle tracking pads can be used and shall have the following properties.

Minimum overall dimensions of the modular systems shall be:

Width of pad along edge of roadway	14 feet
Length of pad	30 feet

Weight (min.) (lbs./sq. ft.)	8
Crush strength (min.) (psi)	400

(l) *Aggregate Bag*. Aggregate bags shall consist of crushed stone or recycled rubber filled fabric with the following properties:

Diameter (inches)	Weight (minimum) (pounds per foot)
6-8	6
10	10
12	15

Rubber used in bags shall be clean, 95 percent free of metal and particulates.

Crushed stone contained in the aggregate bags shall conform to subsection 703.09, Table 703-7 for Class C.

The aggregate bag shall consist of a woven geotextile fabric with the following properties:

Property	Requirement	Test Method
Grab Tensile Strength	90 lbs. min.	ASTM D 4632
Trapezoid Tear Strength	25 lbs. min.	ASTM D 4533
Mullen Burst	300 psi	ASTM D 3786
Ultraviolet Resistance	70%	ASTM D 4355

(m) *Storm Drain Inlet Protection.* Storm drain inlet protection shall consist of aggregate filled fabric with the following dimensions:

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Storm Drain Inlet Protection Properties	Protection Types		
	[1]Type I	[2]Type II	[3]Type III
Diameter	4 in.	4 in.	N/A
Minimum Section Length	7 ft.	5 ft.	5 ft.
Apron Insert	---	30 in. or sized to grate	30 in or sized to grate

[1]Type I protection shall be used with Inlet Type R.
[2]Type II protection shall be used with Combination Inlet. Option A or B
[3]Type III protection Inlet Vane Grate only. Option A or B

The storm drain inlet protection (Type I, II and III) shall consist of a woven geotextile fabric with the following properties:

Property	Test Method	Unit	Requirement
Grab tensile strength	ASTM D 4632	lbs.	minimum 350X280
Mullen Burst Strength	ASTM D 3786	lbs.	600
Trapezoid Tear Strength	ASTM D 4533	lbs.	minimum 110X95
Percent Open Area	COE-22125-86	%	28
Water Flow Rate	ASTM D 4491	gal./min./sq. ft.	250
Ultraviolet Resistance	ASTM D 4355	%	70

Curb roll for storm drain inlet protection (Type I and II) shall have an approximate weight of 7 to 10 pounds per linear foot of device. The device shall be capable of conforming to the shape of the curb. Aggregate contained in the storm drain inlet device shall consist of gravel or crushed stone conforming to Table 703-7 for Class C.

Storm drain inlet protection (Type III) shall have insert containment (option A) or insert without storage capacity (option B).

CONSTRUCTION REQUIREMENTS

208.03 Project Review, Schedule, and Transportation Erosion Control Supervisor. Prior to NTP2 and following approval of SWMP RFC documents, an on-site Environmental Pre-Construction Conference shall be held. The conference shall led by the Contractors Environmental Manager and SWMP Administrator. In addition the following people shall attend:

(1) Independent Quality Control Manager (IQCM),

(2) Independent Quality Control (IQC)program Inspector(s),

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(3) The Superintendent,

(4) Supervisors or Foremen of subcontractors working on the project,

(5) The Department's Region Water Pollution Control Manager (RWPCM),

(6) The Department Project Environmental Representative(s),

(7) Local Governmental representatives as designated by the Department.

(8) Additional personnel as designated by the Department.

At this conference, the attendees shall discuss the SWMP, CDPS-SCP, CDOT and local Municipal Separate Storm Sewer (MS4) requirements, sensitive habitats on site, wetlands, other vegetation to be protected, and the enforcement mechanisms for not meeting the requirements of the Project Agreement.

Prior to beginning construction the Contractor shall evaluate the project site for storm water draining into or through the site. When such drainage is identified, BMPs (i.e., Control Measures) shall be used if possible to divert stormwater from running on-site and becoming contaminated with sediment or other pollutants. The diversion may be accomplished with a temporary pipe or other conveyance to prevent water contamination or contact with pollutants. Run-on water that cannot be diverted shall be treated as construction runoff and adequate BMPs shall be employed.

The SWMP Administrator shall evaluate all non-stormwater coming onto the site, such as springs, seeps, and landscape irrigation return flow. If such flow is identified, BMPs shall be used to protect off-Site water from becoming contaminated with sediment or other pollutants.

The SWMP Administrator shall review existing inlets and culverts to determine if inlet protection is needed due to water flow patterns. Prior to beginning construction, inlets and culverts needing protection shall be protected and the location of the implemented BMP added to the SWMP site map.

Prior to construction, the Contractor shall implement appropriate BMPs for protection of wetlands, sensitive habitat and existing vegetation from ground disturbance and other pollutant sources, in accordance with the approved project schedule as described in subsection 208.03(b).

When additional BMPs are required and approved by the SWMP Administrator, the Contractor shall implement the additional BMPs and the SWMP Administrator shall record and describe them on the SWMP site map.

(a) *Erosion and Sediment Control Activities*. The erosion and sediment control activities shall be included in the weekly meeting update. The project schedule shall specifically indicate the sequence of clearing and grubbing, earthwork operations, and construction of temporary and permanent erosion control features and stabilization. Project schedule shall include erosion and sediment control work for haul roads, borrow pits, storage and asphalt or concrete batch sites, and

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all areas within the project limits. If necessary, the SWMP Administrator shall update proposed sequencing of major activities in the SWMP.

(b) *Erosion Control Management (ECM).* Erosion Control Management for this project shall consist of Erosion Control Inspection and the Administration of the Stormwater Management Plan (SWMP). All ECM staff shall have working knowledge and experience in construction, and shall have successfully completed the TECS as provided by the Department. The Superintendent will not be permitted to serve in an ECM role. The Contractors Erosion Control Inspector and the SWMP Administrator may be the same person in projects involving less than 40 acres of disturbed area.

1. Stormwater Management Plan (SWMP) Administration. The SWMP shall be maintained by a SWMP Administrator. The SWMP Administrator shall have completed the TECS certification training as provided by the Department. In the case of a project requiring only one TECS, the SWMP Administrator may also be the Erosion Control Inspector for the project. The name of the SWMP Administrator shall be recorded on SWMP Plan Section 3.B. The SWMP Administrator shall have full responsibility to maintain and update the SWMP Plan and identify to the Superintendent critical action items needed to conform to the CDPS-SCP as follows:

(1) Complete the SWMP Notebook as described in subsection 208.03 (d).

(2) Participate in the Environmental Pre-construction Conference

(3) Attend Weekly Water Quality Meetings (WWQM)

(4) Attend all Department water quality control inspections. The Contractor and the Contractor's SWMP Administrator will be notified a minimum of five days in advance of each inspection by the Department water quality staff.

(5) Coordinate with the Superintendent to implement necessary actions to reduce anticipated or presently existing water quality or erosion problems resulting from construction activities.

(6) Coordinate with the Superintendent to ensure that all labor, material, and equipment needed to install, maintain, and remove BMPs are available as needed.

(7) During construction, update and record the following items on the SWMP site map as changes occur:

(i) Limits of Construction (LOC)

(ii) Areas of Disturbance (AD)

(iii) Limits of Disturbance (LDA)

(iv) Limits of cut and fill.

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(v) Areas used for storage of construction materials, equipment, soils, or wastes.

(vi) Location of any dedicated asphalt or concrete batch plants.

(vii) Location of construction offices and staging areas.

(viii) Location of work access routes during construction.

(ix) Location of borrow and waste.

(x) Location of temporary, interim and permanent stabilization.

(xi) Location of outfall(s)

(xii) Arrows showing direction of surface flow

(xiii) Structural and non-structural BMPs

(xiv) LDA and LOC lines as defined in subsection 107.25

(8) Amend the SWMP whenever there are: additions, deletions, or changes to BMPs. SWMP revisions shall be recorded immediately. Items shall be dated and initialed by the SWMP Administrator. Specifically, amendments shall include the following:

(i) A change in design, construction, operation, or maintenance of the site which would require the implementation of new or revised BMPs; or

(ii) Changes when the SWMP proves to be ineffective in achieving the general objectives of controlling pollutants in stormwater discharges associated with construction activity.

(iii) Changes when BMPs are no longer necessary and are removed.

(9) Complete vegetative survey transects as required in accordance with CDOT Erosion Control and Stormwater Quality Guide.

(10) Start a new site map before the current one becomes illegible. All site maps shall remain in the SWMP notebook.

(11) Document all inspection and maintenance activities. The SWMP and documentation shall be kept on the project site.

(12) When adding or revising BMPs on the SWMP, add a narrative explaining what, when, where, why, and how the BMP is being used, and add a detail to the SWMP notebook.

(i) How to install and inspect the BMP

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(ii) Where to install the BMP

(iii) When to maintain the BMP

(13) If using existing topography, vegetation, etc. as a BMP, label it as such on the SWMP site map; add a narrative as to when, where, why, and how the BMP is being used.

(14) Indicate BMPS in use or not in use by recording on Standard Plans M-208-1, M-216-1, and M-615-1 in the SWMP notebook.

(15) Record on the SWMP, the approved Method Statement for Containing Pollutant Byproducts.

(16) Update the potential pollutants list in the SWMP notebook and Spill Response Plan throughout construction.

2. Erosion Control Inspection.

Erosion control inspection shall be performed by TECS certified staff assigned as Erosion Control Inspector (ECI) to the project. One ECI is required for every 40 acres of total disturbed area which is currently receiving temporary and interim stabilization measures as defined in subsection 208.04 (e). An ECI shall not be responsible for more than 40 acres in the project. Accepted permanent stabilization methods as defined in subsection 208.04 (e) will not be included in the 40 acres.

ECI duties shall be as follows:

(1) Coordinate with the SWMP Administrator on reporting the results of inspections.

(2) Review the construction site for compliance with the Stormwater Construction Permit.

Inspect with the Superintendent and the IQC Manager (or their designated representatives) the stormwater management system at least every seven calendar days. Post storm event inspections shall be conducted within 24 hours after the end of any precipitation or snow melt event that may cause surface erosion. If no construction activities will occur following a storm event, post-storm event inspections shall be conducted prior to commencing construction activities, but no later than 72 hours following the storm event. The occurrence of delay in inspections shall be documented in the inspection report. Form 1176 shall be used for all 7 day inspections and inspections following storm events. The Contractor shall notify the Erosion Control Inspector when a storm event occurs. The Contractor shall notify the EM and the Department when post-storm event inspections and 7-day inspections are scheduled. The Department and the EM may attend at their discretion. The Contractor shall communicate findings to the Independent Quality Control (IQC) team and EM. Failure to perform inspections on time will result in non-compliance points in accordance with subsection 208.09.

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Inspections are not required at sites when construction activities are temporarily halted, when snow cover exists over the entire site and melting conditions do not pose a risk of surface erosion. This exception shall be applicable only during the period where melting conditions do not exist, and applies to the routine 7 day inspections and the post-storm event inspections. The following information shall be documented on Form 1176 for use of this exclusion: dates when snow cover occurred, date when construction activities ceased, and date melting conditions began.

The order of precedence for required inspections shall be as follows:

(i) Headquarter water quality inspections

(ii) Region water quality inspections

(iii) Post-storm event inspections

(iv) 7 day inspections

When one of the listed inspections is performed, the inspections listed below it need not be performed on that day if the required personnel participated in the inspection.

For example: A 7 day inspection is not required on the same day a headquarters or Region inspection is conducted. A sheet shall be placed in the inspections area of the SWMP Notebook to refer to the date inspection performed.

(3) Follow all other agency Stormwater requirements and inspections unless a waiver or other agreement has been made.

(4) The ECI shall immediately report to the Contractor's Superintendent and the SWMP Administrator the following instances of noncompliance:

(i) Noncompliance which may endanger health or the environment.

(ii) Spills or discharge of hazardous substance or oil which may cause pollution of waters of the State.

(iii) Discharge of stormwater which may cause an exceedance of a water quality standard.

(iv) Upset conditions that occur on site.

(5) Spills, leaks, or overflows that result in the discharge of pollutants shall be documented on the Form 1176 by the ECI. The ECI shall record the time and date, weather conditions, reasons for spill, and how it was remediated.

(d) *Documentation Available on the Project.* The following Contract documents and references will be made available for reference at the project field office during construction:

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1. SWMP Notebook. The Contractor will provide a SWMP Notebook at the Preconstruction Conference, which is and shall become and remain the property of the Department. The Contractor shall provide the contents required for the entire notebook, as detailed below. The notebook shall be stored in the Contractor's field office or at another on-site location approved by the Department. The SWMP Administrator shall modify and update the notebook when changes occur in site conditions to reflect current conditions; except when changes to the notebook cannot be reasonably achieved at the time of field condition changes, such as when obtaining specifications from the manufacturer or engineering design for a retention structure. In such cases, the Contractor will make revisions as soon as practicable, but in no case more than 72 hours after the change(s) in control measure installation and/or implementation occur at the site. In such cases, a notation must also be included with the SMWP that includes the date, type and location of the change(s) in the field. The following Contract documents and reports shall be kept, maintained, and updated in the notebook under the appropriate items by the SWMP Administrator:

(1) SWMP Plan Sheets - Notes, tabulation, sequence of major activities, area of disturbance, existing soil data, existing vegetation percent cover, potential pollutant sources, receiving water, non-stormwater discharges and environmental impacts.

(2) Site Map and Plan Title Sheet -Construction site boundaries, ground surface disturbance, limits of cut and fill, flow arrows, structural BMPs, non-structural BMPs, Springs, Streams, Wetlands and surface water. Also included on the sheets is the protection of trees, shrubs and cultural resources.

(3) Specifications - Standard and Project special provisions related to Stormwater and Erosion Control.

(4) Standard Plans M-208-1, M-216-1 and M-615-1.

(5) BMP Details not in Standard Plan M-208-1 - Non-standard details.

(6) Weekly meeting sign in sheet.

(7) Calendar of Inspections -Calendar of inspections marking when all inspections take place.

(8) Form 1176 – Weekly meeting notes and inspection report.

(9) Region and Headquarter Water Quality Reports, Non-conformance Notice (NCNs) Non-conformance Records (NCRs) relating to Water Quality.

(10) Description of Inspection and Maintenance Methods - Description of inspection and maintenance methods implemented at the site to maintain all BMPs identified in the SWMP and Items not addressed in the design.

(11) Spill Response Plan - Reports of reportable spills submitted to CDPHE

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(12) List and Evaluation of Potential Pollutants - List of potential pollutants as described in subsection 107.25 and approved Method Statement for Containing Pollutant Byproducts.

(13) Other Correspondence e.g., agreements with other MS4s, approved deferral request, CDPHE audit documentation, and other miscellaneous documentation.

(14) TECS Certifications of the SWMP Administrator and all of the Contractor's ECIs, keep current through the life of the project.

(15) Environmental Pre-construction Conference – Conference agenda with a certification of understanding of the terms and conditions of the CDPS-SCP and SWMP. The certification shall be signed by all attendees. A certification shall also be signed by all attendees of meetings held for new subcontractors beginning work on the project that could adversely affect water quality after the Environmental Pre-construction Conference has been held.

(16) All Project Environmental Permits - All project environmental permits and associated applications and certifications, including, CDPS-SCP, Senate Bill 40, USACE 404,temporary stream crossings, dewatering, biological opinions and all other permits applicable to the project, including any separate CDPS-SCP obtained by the Contractor for staging area on private property, asphalt or concrete plant, etc.

(17) Photographs Documenting Existing Vegetation – Project photographs shall be time stamped on paper with a maximum of four colored images per 8 ½ inch by 11 inch sheet and/or a digital copy of all photographs on CD-ROM/Flash Drive in (JPG format), documenting existing vegetation prior to construction commencing. On the bottom of each photograph shall be a description using Station Number or Mile Post of where the photograph was taken.

(18) Permanent Water Quality Plan Sheets - Plan sheets and specifications for permanent water quality structures, riprap.

The Contractor will provide and insert permanent water quality plan sheets once released for construction. The Contractor shall also provide and insert all other documents and reports as they become available during construction.

The Contractor shall submit a complete electronic copy of the SWMP notebook to the Department prior to commencement of construction and monthly SWMP notebook electronic updates throughout the duration of construction.

The SWMP Administrator shall finalize the SWMP for delivery to the Department within 30 days of close out of the CDPS-SCP. SWMP completeness shall be approved by the Department, corrections to the SWMP shall be at the Contractor's expense. The following Reference materials shall be used:

(1) CDOT Erosion Control and Stormwater Quality Guide.

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(2) CDOT Erosion Control and Stormwater Quality Field Guide.

(3) CDOT Specifications and Standards.

(e) *Weekly Meetings.* The Environmental Manager and SWMP Administrator shall conduct a Weekly Water Quality Review ("WWQR") meeting. The Superintendent and IQC water quality staff shall attend and participate. Supervisors involved in construction activities that could adversely affect water quality shall attend. The Department shall be notified in advance of this meeting and may attend at their discretion. The meeting shall follow an agenda prepared by the SWMP Administrator and have a sign in sheet on which the names of all attendees shall be recorded. The Developer shall take minutes of the meeting including notes of water quality comments and action items at each weekly meeting. Meeting minutes shall be provided to the Department. The agenda and sign in sheets shall be placed in the SWMP notebook. The Department and IQC staff may add items to the agenda at their discretion. At this meeting the following shall be discussed and documented on Form 1176:

(1) Requirements of the SWMP.

(2) Problems that may have arisen in implementing the site specific SWMP or maintaining BMPs.

(3) Unresolved issues from inspections and concerns from last inspection

(4) BMPS that are to be installed, removed, modified, or maintained.

(5) Planned activities that will effect stormwater in order to proactively phase BMPs.

(6) Recalcitrant inspection findings

All subcontractors who were not in attendance at the Environment Pre-construction conference shall be briefed on the project by the Engineer, Superintendent, and the SWMP Administrator prior to start of work. The SWMP Administrator shall record the names of these subcontractors as an addendum to the list of attendees, and added the SWMP Notebook.

(f) *Items to Be Completed Prior to SW Permit Close Out.*

(1) Reclamation of Washout Areas. After concrete operations are complete, washout areas shall be reclaimed in accordance with subsection 208.05(n).

(2) Upon completion of final stabilization the Department will perform a final site inspection of the project area to confirm final stabilization requirements have been met. The Department will issue approval in writing to the Contractor. The Contractor shall not close-out the CDPS-SCP until receipt of this approval.

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208.04 Best Management Practices (BMPs) for Stormwater.

The SWMP Administrator shall modify the SWMP to clearly describe and locate all BMPs implemented at the site to control potential sediment discharges.

Vehicle tracking control shall be used at all vehicle and equipment exit points from the site to prevent sediment exiting the Limits of Construction (LOC) of the project site. The SWMP Administrator shall record vehicle tracking control pad locations on the SWMP site map.

New inlets and culverts shall be protected during their construction. Appropriate protection of each culvert and inlet shall be installed immediately. When riprap is called for at the outlet of a culvert, it shall be installed within 24 hours of completion of each pipe. The Contractor shall remove sediment, millings, debris, and other pollutants from within the newly constructed drainage system in accordance with the CDPS-SCP, prior to use, at the Contractor's expense. All removed sediment shall be disposed of outside the project limits in accordance with all applicable regulations.

Concrete products wasted on the ground during construction shall include, but shall not be limited to: excess concrete removed from forms, spills, slop, and all other unused concrete are potential pollutants that shall be contained or protected by an approved BMP at a pre-approved containment area. The concrete shall be picked up and recycled in accordance with 6 CCR 1007-2 (CDPHE Regulations Pertaining to Solid Waste Sites and Facilities) at regular intervals, as directed. The uses of recycled concrete from approved recycling facilities shall be in accordance with Section 203.

(a) *Unforeseen Conditions.* The Contractor shall design and implement erosion and sediment BMPs for correcting conditions unforeseen during the design of the project, or for emergency situations, that develop during construction. The Department's "Erosion Control and Stormwater Quality Guide" shall be used as a reference document for the purpose of designing erosion and sediment BMPs. The Contractor may install non-standard BMPs or BMPs with non-standard measures and methods without prior approval. The ICQM and EM shall review all non-standard BMPs. The Contractor shall modify and/or replace the non-standard measures and methods if found unsuitable or ineffective by the IQCM, EM, or the Department. All non-standard BMPs shall be documented in Section 5 of the SWMP Notebook.

(b) *Other Agencies.* If City and County of Denver, City of Aurora, CDPHE, US Army Corps of Engineers (USACE), or the Environmental Protection Agency (EPA) reviews the project site and requires additional measures to prevent and control erosion, sediment, or pollutants, the Contractor shall cease and desist activities resulting in pollutant discharge and immediately implement these measures. If the work may negatively affect another MS4, the Contractor shall cease and desist activities resulting in the discharge and shall implement appropriate measures to protect the neighboring MS4, including installing additional measures.

(c) *Work Outside the Right of Way.* Disturbed areas, including staging areas, which are outside CDOT ROW and outside easements acquired by CDOT for construction, are the responsibility of the Contractor. These areas may be subject to a separate CDPS-SCP, additional environmental clearance and/or other permits. The Contractor shall acquire these permits and submit copies to the

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Department prior to any disturbance. These permits, shall be acquired and all erosion and sediment control work performed at the Contractor's expense. These areas are subject to inspections by CDOT or any other agency, as agreed upon in writing.

(d) *Construction Implementation*. The Contractor shall incorporate BMPs into the project as outlined in the accepted schedule.

(e) *Stabilization*. Once earthwork has started, the Contractor shall continue erosion BMPs until permanent stabilization of the area has been completed and accepted. Clearing, grubbing and slope stabilization measures shall be performed regularly to ensure final stabilization. Failure to properly maintain erosion control and stabilization methods, either through improper phasing or sequencing will require the Contractor to repair or replace sections of earthwork. The Contractor shall schedule and implement the following stabilization measures during the course of the project:

(1) Temporary Stabilization. At the end of each day, the Contractor shall stabilize disturbed areas by surface roughening, vertical tracking, or a combination thereof. Disturbed areas are locations where actions have been taken to alter the existing vegetation and/or underlying soil of a site, such as clearing, grading, road bed preparation, soil compaction, and movement and stockpiling of top soils. Other stabilization measures may be implemented, as approved. The maximum area of temporary stabilization shall not exceed 34 acres.

(2) Interim Stabilization. Stockpiles and disturbed areas as soon as known with reasonable certainty that work will be temporarily halted for 14 days or more shall be stabilized using one or more of the specified following methods:

(i) Application of 1.5 tons of mechanically crimped certified weed free hay or straw in combination with an approved organic mulch tackifier.

(ii) Placement of bonded fiber matrix in accordance with Section 213.

(iii) Placement of mulching (hydraulic) wood cellulose fiber mulch with tackifier, in accordance with Section 213.

(iv) Application of spray-on mulch blanket in accordance with Section 213. Magnesium Chloride, Potassium Chloride and Sodium Chloride, or other salt products, will not be permitted as a stabilization method.

Protection of the interim stabilization method is required. Reapplication may be required as approved.

(3) Summer and Winter Stabilization. Summer and winter stabilization is defined as months when seeding will not be permitted. As soon as the Contractor knows shutdown is to occur, interim stabilization shall be applied to the disturbed area. Protection of the interim stabilization method is required. Reapplication of interim stabilization may be required as directed.

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(4) Permanent Stabilization. Permanent stabilization is defined as the covering of disturbed areas with seeding, mulching with tackifier, soil retention coverings, and such non-erodible methods such riprap, road shouldering, etc., or a combination thereof as required by the Contract. Other permanent stabilization techniques may be proposed by the Contractor, in writing, and shall be used when approved in writing by the Department. Permanent stabilization shall begin within 48 hours after topsoil placement, soil conditioning, or combination thereof starts and shall be pursued to completion.

(5) Final Stabilization. Final stabilization is defined as when all ground disturbing activities at the site have been completed, and uniform vegetative cover has been established with an individual plant density of at least 70 percent of pre-disturbance levels, or equivalent permanent physical erosion reduction methods have been employed. The Department will perform a final site inspection of the project area to confirm final stabilization has been met. The Department will issue approval in writing to the Contractor. The Contractor shall not close-out the CDPS-SCP until receipt of this approval.

(f) *Maintenance*. Erosion and sediment control practices and other protective measures identified in the SWMP as BMPs for stormwater pollution prevention shall be maintained in effective operating condition until the CDPS-SCP has been closed-out. BMPs shall be continuously maintained in accordance with good engineering, hydrologic and pollution control practices, including removal of collected sediment when silt depth is 50 percent or more of the height of the erosion control device. When possible, the Contractor shall use equipment with an operator rather than labor alone to remove the sediment.

Maintenance of erosion and sediment control devices shall include replacement of such devices upon the end of their useful service life as recommended by the Contractor. Maintenance of rock check dams and vehicle tracking pads shall be limited to removal and disposal of sediment or addition of aggregate. Damages resulting from failure to maintain BMPs shall be paid at the contactors expense.

Complete site assessment shall be performed as part of comprehensive inspection and maintenance procedures, to assess the adequacy of BMPs at the site and the necessity of changes to those BMPs to ensure continued effective performance. Where site assessment results in the determination that new or replacement BMPs are necessary, the BMPs shall be installed to ensure continuous effectiveness. When identified, BMPs shall be maintained, added, modified or replaced as soon as possible, immediately in most cases.

New or replaced BMPs will be paid for by the Contractor. Devices damaged due to the Contractor's negligence shall be replaced at Contractor’s expense.

From the time seeding and mulching work begins until the date the Contract work is accepted, the Contractor shall maintain all seeded areas. Damage to seeded areas or to mulch materials shall be immediately restored. Damage to seeded areas or to mulch materials due to Contractor negligence shall be immediately restored at the Contractor’s expense. Restoration of other damaged areas will be paid for by the Contractor.

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Temporary BMPs may be removed upon completion of the project, as determined by the Water Quality Partial Acceptance walk-through. If removed, the area in which these BMPs were constructed shall be returned to a condition similar to that which existed prior to its disturbance. Removed BMPs shall become the property of the Contractor.

If a project delay occurs, the Contractor shall be responsible to continue erosion and sediment control operations beyond the original contract time.

Sediment removed during maintenance of BMPs and material from street sweeping may be used in or on embankment, provided it meets conditions of Section 203 and is distributed evenly across the embankment.

Whenever sediment collects on the paved surface, the surface shall be cleaned. Street washing will not be allowed. Storm drain inlet protection shall be in place prior to shoveling, sweeping, or vacuuming. Sweeping shall be completed with a pickup broom or equipment capable of collecting sediment. Sweeping with a kick broom will not be allowed.

Material from pavement saw cutting operations shall be cleaned from the roadway surface during operations using a vacuum. A BMP, such as a berm, shall be placed to contain slurry from joint flushing operations until the residue can be removed from the soil surface. Aggregate bags, erosion

logs or other permeable BMPs shall not be used. Residue shall not flow into driving lanes. It shall be removed and disposed of in accordance with subsection 107.25(b) 13. Material containment and removal will not be paid for separately, but shall be included in the work.

208.05 Construction of BMPs. BMPs shall be constructed in accordance with Standard Plans M-208-1, M-216-1 and with the following.

(a) *Seeding, Mulching, Sodding, Soil Retention Blanket*. Seeding, mulching, sodding, and soil retention blanket shall be performed in accordance with Sections 212, 213, and 216.

(b) *Erosion Bales*. The bales shall be anchored securely to the ground with wood stakes.

(c) *Silt Fence*. Silt fence shall be installed in locations specified in the Contract prior to any grubbing or grading activity.

(d) *Temporary Berms*. Berms shall be constructed to the dimensions shown in the Contract, and sufficiently compacted to prevent erosion or failure. If the berm erodes or fails, it shall be immediately repaired or replaced at the Contractor's expense.

(e) *Temporary Diversion*. Diversions shall be constructed to the dimensions shown in the Contract, and graded to drain to a designated outlet. The berm shall be sufficiently compacted to prevent erosion or failure. If the diversion erodes or fails, it shall be immediately repaired or replaced at the Contractor's expense.

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(f) *Temporary Slope Drains*. Temporary slope drains shall be installed prior to installation of permanent facilities or growth of adequate ground cover on the slopes. All temporary slope drains shall be securely anchored to the slope. The inlets and outlets of temporary slope drains shall be protected to prevent erosion.

(g) *Silt Berm*. Prior to installation of silt berms, the Contractor shall prepare the surface of the areas in which the berms are to be installed such that are they free of materials greater than 2 inches in diameter and are suitably smooth for the installation of the silt berms, as approved. Silt berms shall be secured with spikes. The Contractor shall install the silt berm in a manner that will prevent water from going around or under the silt berm. Silt berms shall be installed on top of soil retention blanket.

(h) *Rock Check Dam*. Rock shall be installed at locations shown on the plans. Rock check dams shall conform to the dimensions shown on the plans.

(i) *Riprap Outlet Protection*. Geotextile used shall be protected from cutting or tearing. Overlaps between two pieces of geotextile shall be 1 foot minimum. Riprap size shall be as shown on the plans.

(j) *Storm Drain Inlet Protection*. Prior to installation, the Contractor shall sweep the surface of the area in which the storm drain inlet protection devices are to be installed such that the pavement is free of sediment and debris. The ends of the inlet protection Type 1 and Type 2 shall extend a minimum of 1 foot past each end of the inlet.

The Contractor shall remove all accumulated sediment and debris from the surface surrounding all storm drain inlet protection devices after each rain event or as directed. The Contractor shall remove accumulated sediment from Type II and III containment area when it is more than a maximum one third full of sediment, or as directed.

The Contractor shall protect storm drain facilities adjacent to locations where pavement cutting operations involving wheel cutting, saw cutting, sand blasting, or abrasive water jet blasting are to take place.

(k) *Sediment Trap*. Sediment traps shall be installed to collect sediment laden water and to minimize the potential of pollutants leaving the project site. Locations shall be as shown on the plans or as directed.

Sediment traps shall be constructed prior to disturbance of upslope areas and shall be placed in locations where runoff from disturbed area can be diverted into the trap.

The area under the embankment shall be cleared, grubbed and stripped of any vegetation and roots.

Fill material for the embankment shall be free of roots or other vegetation, organic material, large stones, and other objectionable material.

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Sediment shall be removed from the trap when it has accumulated to one half of the wet storage depth of the trap and shall be disposed of in accordance with subsection 208.04(f).

(l) *Erosion Logs*. Erosion logs shall be embedded 2 inches into the soil. Stakes shall be embedded to a minimum depth of 12 inches. A shallower depth may be permitted if rock is encountered, however non-standard installation methods are subject to the requirements of 208.04 (a) Unforeseen Conditions.

The Contractor shall maintain the erosion logs during construction to prevent sediment from passing over or under the logs.

(m) *Silt Dikes*. Prior to installation of silt dikes, the Contractor shall prepare the surface of the areas in which the silt dikes are to be installed such that they are free of materials greater than two inches in diameter and are suitably smooth for the installation of the silt dikes.

(n) *Concrete Washout Structure*. The concrete washout structure shall meet or exceed the dimensions shown on the plans or be used in accordance with manufacturer's recommendations.

Concrete washout structure shall conform to standard plan M-208-1 and shall meet the following requirements:

(1) Structure shall contain all washout water.

(2) Stormwater shall not carry wastes from washout and disposal locations.

(3) The site shall be located a minimum of 50 horizontal feet from State waters and shall meet all requirements for containment and disposal as defined in subsection 107.25.

(4) The site shall be signed as "Concrete Washout".

(5) The site shall be accessible to appropriate vehicles.

(6) Freeboard capacity shall be included into structure design to reasonably ensure the structure will not overtop during or because of a precipitation events.

(7) The Contractor shall prevent tracking of washout material out of the washout structure.

(8) Solvents, flocculents, and acid shall not be added to wash water.

(9) The structure shall be surrounded on three sides by a compacted berm.

(10) The structure shall be fenced with orange plastic construction fencing to provide a barrier to construction equipment and to aid in identification of the concrete washout area.

(11) Concrete waste, liquid and solid, shall not exceed 2/3 the storage capacity of the washout structure.

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Pre-fabricated concrete washout structures shall meet the following requirements:

(1) Structure shall contain all washout water.

(2) Structure shall be located 50 horizontal feet away from State waters, and shall be confined so that no potential pollutants will enter State waters and other sensitive areas are as defined in the Contract. The site shall be delineated with orange plastic fence or other means and signed as "Concrete Washout".

(3) The site shall be accessible to appropriate vehicles.

(4) Freeboard capacity shall be included into structure design to reasonably ensure the structure will not overtop during or because of a precipitation event.

(5) Solvents, flocculants, and acid shall not be added to wash water.

(6) Concrete waste, liquid and solid, shall not exceed 2/3 the storage capacity of the washout structure.

(7) Prefabricated structures cannot be moved when they contain liquid, unless otherwise approved.

(8) The concrete washout structure shall be completed and ready for use prior to concrete placement operations.

(9) Washout areas shall be checked and maintained as required. On site permanent disposal of concrete washout waste is not allowed.

All liquid and solid wastes, including contaminated sediment and soils generated from concrete washout shall be hauled away from the site and disposed of properly at the Contractor's expense.

(o) *Vehicle Tracking Pad (VTP)*. Vehicle tracking pads shall be constructed to the minimum dimensions shown in the Contract. Dimensions of the VTP may be modified to meet site conditions, however non-standard dimensions are subject to the requirements of 208.04 (a) Unforeseen Conditions. Construction of approved vehicle tracking pads shall be completed before any disturbance of the area.

The Contractor shall maintain each vehicle tracking pad during the entire time that it is in use for the project. The vehicle tracking pad shall be removed at the completion of the project unless otherwise directed by the Department. Additional aggregate may be required for maintenance and will be paid for by the Contractor.

(p) *Detention Pond*. Permanent detention ponds shown on the construction plans may be used as temporary BMPs if all the following conditions are met:

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(1) The pond is designated as a construction BMP in the SWMP.

(2) The pond outfall and outlet are designed and implemented for use as a BMP during construction in accordance with good engineering, hydrologic, and pollution control practices. The stormwater discharges from the outfall shall not cause degradation or pollution of State waters, and shall have BMPs, as appropriate.

(3) All silt shall be removed and the pond returned to the design grade and contour prior to project acceptance

(q) *Aggregate Bag*. Aggregate bags shall be placed on a stable surface, consisting of pavement, grass or gravel. Aggregate bags shall be placed to conform to the surface without gaps. Discharge water shall not cause erosion.

(r) *Surface Roughening*. Surface roughening creates horizontal grooves along the contour of the slope. Roughening may be accomplished by furrowing, scarifying, ripping or disking the soil surface to create a 2 to 4 inch minimum variation in soil surface. Surface roughening will not be paid for separately, but shall be included in the work.

(s) *Vertical Tracking*. Vertical tracking involves driving a tracked vehicle up and down the soil surface and creating horizontal grooves and ridges along the contour of the slope. Sandy soils or soils that are primarily rock need not be tracked. Vertical tracking will not be paid for separately, but shall be included in the work.

208.06 Materials Handling and Spill Prevention. The SWMP Administrator shall clearly describe and record on the SWMP, all practices implemented at the site to minimize impacts from procedures or significant material that could contribute pollutants to runoff. Areas or procedures where potential spills can occur shall have a Spill Response Plan in place as specified in subsections 107.25(b) 6 or 208.06(c). Construction equipment, fuels, lubricants, and other petroleum distillates shall not be stored or stockpiled within 50 horizontal feet of any State waters or more if the Contractor determines necessary. Equipment fueling and servicing shall occur only within approved designated areas.

(a) *Bulk Storage Structures.* Bulk storage structures for petroleum products and other chemicals shall have impervious secondary containment or equivalent adequate protection so as to contain all spills and prevent any spilled material from entering State waters. Secondary containment shall be capable of containing the combined volume of all the storage containers plus at least 10 percent freeboard. For secondary containment that is used and may result in accumulation of stormwater within the containment, a plan shall be implemented to properly manage and dispose of all accumulated stormwater which is deemed to be contaminated (e.g., has an unusual odor or sheen).

(b) *Lubricant Leaks.* The Contractor shall inspect equipment, vehicles, and repair areas daily to ensure petroleum, oils, and lubricants (POL) are not leaking onto the soil or pavement. Absorbent material or containers shall be used to prevent leaking POL from reaching the soil or pavement. The Contractor shall have onsite approved absorbent material or containers of sufficient capacity to contain any POL leak that can reasonably be foreseen. The Contractor shall inform all Spill

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Response Coordinators in accordance with the Spill Response Plan if unforeseen leakage is encountered. All materials resulting from POL leakage control and cleanup shall become the property of the Contractor and shall be removed from the site. Control, cleanup, and removal of by-products resulting from POL leaks shall be performed at the Contractor's expense.

(c) *Spill Response Plan*. A spill Response Plan shall be developed and implemented to establish operating procedures for handling potential pollutants and preventing spills.

The Response Plan shall contain the following information:

(1) Identification and contact information of each Spill Response Coordinator

(2) Locations of areas on project site where equipment fueling and servicing operations are permitted.

(3) Location of cleanup kits.

(4) Quantities of chemicals and locations stored on site.

(5) Label system for chemicals and Safety Data Sheets (SDS) for products.

(6) Clean up procedures to be implemented in the event of a spill that does not enter State waters or ground water.

(7) Procedures for spills of any size that enter surface waters or ground water, or have the potential to do so. CDOT's Erosion Control and Stormwater Quality Guide contains Spill notification contacts and phone numbers required in the Spill Response Plan.

(8) A summary of the employee training provided.

Information in items (1) through (8) shall be updated in the SWMP Notebook when they change.

208.07 Stockpile Management. Material stockpiles shall be located 50 horizontal feet away from State waters, and shall be confined so that no potential pollutants will enter State waters and other sensitive areas as defined in the Contract

Erodible stockpiles (including topsoil) shall be contained with acceptable BMPs at the toe (or within 20 feet of the toe) throughout construction. The SWMP Administrator shall describe, detail, and record the sediment control devices on the SWMP.

208.08 Limits of Disturbance. The Contractor shall limit construction activities to those areas within the limits of disturbance shown on the plans and cross-sections. Construction activities, in addition to the Contract work, shall include the on-site parking of vehicles or equipment, on-site staging, on-site batch plants, haul roads or work access, and all other action which would disturb existing soil conditions.

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Construction activities beyond the limits of disturbance due to Contractor negligence shall be restored to the original condition by the Contractor at the Contractor's expense. The SWMP Administrator shall tabulate additional disturbances not identified in the CDPS-SCP application and indicate changes to locations and quantities on the SWMP. The Contractor shall report the changes and additional disturbances to the IQC, EM, the Department, Water Quality Control Division of CDPHE and all other involved agencies.

The Contractor shall pursue and stabilize all disturbances to completion.

208.09 Failure to Perform Erosion Control. Failure to implement the Stormwater Management Plan is a violation of the CDPS–SCP and CDOT specifications. The Department is obligated to implement enforcement mechanisms in accordance with CDOT's MS4 Permit COS000005 for Stormwater Management and erosion control Best Management Practices. Penalties may be assessed to the Contractor by the appropriate agencies. Penalties will be assessed by the Department as Noncompliance Points in accordance with Schedule 6 (*Performance Mechanism*). All fines assessed to the Department for the Contractor's failure to implement the SWMP will be deducted from moneys due the Contractor in accordance with Schedule 6 (*Performance Mechanism*).

Noncompliance Points will be applied for failure to comply with the CDPS-SCP and the Construction Standards, including the following:

(1) Failure to include erosion control in the project schedule or failure to include erosion control in each schedule update as specified in subsection 208.03(b).

(2) Failure of the Contractor to perform the inspections required by subsection 208.03(c) 2.

(3) Failure of the Contractor to implement necessary actions required by the Engineer as required by subsection 208.03(c).

(4) Failure to amend the SWMP and implement BMPs as required by subsection 208.04.

(5) Failure to keep documentation and records current.

(6) Failure to construct or implement erosion control or spill containment measures required by the Contract, or failure to construct or implement them in accordance with the Contractor's approved schedule as required by subsection 208.06(c).

(7) Failure to limit temporary stabilization to 34 or fewer acres as required by subsection 208.04 (e).

(8) Failure to replace or perform maintenance on an erosion control feature after notice from the Department or from a water quality inspection as required by subsection 208.04(f).

(9) Failure to remove and dispose of sediment from BMPs as required.

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(10) Failure to install and properly utilize a concrete washout structure for containing washout from concrete placement operations.

(11) Failure to perform stabilization as required by subsection 208.04 (e).

(12) Failure of the Superintendent or designated representative to attend inspections as required by subsection 208.03(c) and record findings in the appropriate form.

(13) Failure to prevent discharges not composed entirely of stormwater from leaving the Construction Site.

(14) Failure to provide the survey of Permanent Water Quality BMPs when required on the project in accordance with 208.10.

If systemic Nonconforming Work associated with failure to perform erosion control is identified by the Developer or identified by the Department by the issuance of a corrective action request (CAR) notice to the Developer, the Developer shall submit a Corrective Action Plan for Approval to the Department as required by Schedule 8 (*Project Administration*).

REVISION OF SECTION 240
PROTECTION OF MIGRATORY BIRDS
BIOLOGICAL WORK PERFORMED BY THE CONTRACTOR'S BIOLOGIST

Section 240 is hereby added to the Standard Specifications as follows:

DESCRIPTION

240.01 The Contractor shall schedule clearing and grubbing operations and Work on structures to avoid taking (pursue, hunt, take, capture or kill; attempt to take, capture, kill or possess) migratory birds protected by the Migratory Bird Treaty Act ("MBTA"). The Contractor shall retain a qualified wildlife biologist for this Project. The wildlife biologist shall have a minimum of three years of experience conducting migratory bird surveys and implementing the requirements of the MBTA. The Contractor shall submit documentation of the biologist's education and experience.

The wildlife biologist shall survey the location of each protected nest, bird species, the protection method used, and the date installed. A copy of these records shall be submitted to the Department for acceptance.

(a) *Vegetation Removal.*

When possible, vegetation shall be cleared prior to the time when active nests are present. Vegetation removal activities shall be timed to avoid the migratory bird breeding season which begins on April 1 and runs to August 31. All areas scheduled for clearing and grubbing between April 1 and August 31 shall first be surveyed within the Work limits for active migratory bird nests. The Contractor's wildlife biologist shall also survey for active migratory bird nests within 50 feet outside work limits. The Contractor's personnel shall enter areas outside the Right-of-Way in accordance with (e) Permission to Enter Property. The Contractor shall avoid all active migratory bird nests. The Contractor shall avoid the area within 50 feet of the active nests or the area within the distance recommended by the wildlife biologist until all nests within that area have become inactive. Inactive nest removal and other necessary measures shall be incorporated into the Work as follows:

1. Tree and Shrub Removal or Trimming. Tree and shrub removal or trimming shall occur before April 1 or after August 31 if possible. If tree and shrub removal or trimming must occur between April 1 and August 31, a survey for active nests shall be conducted by the wildlife biologist within the seven Calendar Days immediately prior to the beginning of Work in each area of tree and shrub removal or trimming. The survey shall be conducted for each phase of tree and shrub removal or trimming.

2. If an active nest containing eggs or young birds is found, the tree or shrub containing the active nest shall remain undisturbed and protected until the nest becomes inactive. The nest shall be protected by placing fence (plastic) a minimum distance of 50 feet from each nest to be undisturbed. This buffer dimension may be changed if determined appropriate by the wildlife biologist and Approved by the Department. Work shall not proceed within the fenced buffer area until the young have fledged or the nests have become inactive. If the fence is knocked down or destroyed by the Contractor, the Department will suspend the Work, wholly or in part, until the fence is satisfactorily repaired at the Contractor's expense. Time lost due to such suspension will not be considered a basis for adjustment of time charges, but will be charged as contract time.

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REVISION OF SECTION 240
PROTECTION OF MIGRATORY BIRDS
BIOLOGICAL WORK PERFORMED BY THE CONTRACTOR'S BIOLOGIST

(b) *Surveys*

1. Due to the potential for encountering ground nesting birds' habitat, if Work occurs between April 1 and August 31, the area shall be surveyed by the Contractor's wildlife biologist within the seven Calendar Days immediately prior to ground disturbing activities.

2. The wildlife biologist shall conduct dusk and dawn surveys of Bald Eagle roosts within seven Calendar Days prior to the start of any Construction during the winter season, November 15 to March15. If a Bald Eagle roost is identified, Construction activity shall not proceed within 0.25 mile of active nocturnal roost sites between November 15 and March 15.

3. The wildlife biologist shall conduct raptor nest surveys within 0.5 mile of the Site prior to the start of Construction and annually during the appropriate season. This survey can be done with binoculars. If Construction activities are located within the CPW recommended buffer zone for specific raptors, "NO WORK" zones shall be established around active sites during Construction according to the CPW standards or as recommended by the wildlife biologist in consultation with the CPW. The "NO WORK" zone shall be marked with either fencing or signing. Work shall not proceed within a "NO WORK" zone until the wildlife biologist has determined that the young have fledged or the nest is unoccupied.

(c) *Work on structures*

1. The Contractor shall prosecute Work on structures in a manner that does not result in a taking of migratory birds protected by the Migratory Bird Treaty Act ("MBTA"). The Contractor shall not prosecute the Work on structures during the primary breeding season, April 1 through August 31, unless he takes the following actions:

   A. The Contractor shall remove existing nests after August 31 and prior to April 1 of the following year.

   B. During the time that the birds are trying to build or occupy their nests, between April 1 and August 31, the Contractor shall monitor the structures at least once every three Calendar Days for any nesting activity.

   C. If the birds have started to build any nests, they shall be removed before the nest is completed. Water shall not be used to remove the nests if nests are located within 50 feet of any surface waters.

   D. Installation of netting may be used to prevent nest building. The netting shall be monitored and repaired or replaced as needed. Netting shall consist of a mesh with openings that are ¾ inch by ¾ inch or less.

2. If an active nest become established, i.e., there are eggs or young in the nest, all Work that could result in abandonment or destruction of the nest shall be avoided until the young have fledged or the nest is unoccupied as determined by the wildlife biologist and Approved by the

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BIOLOGICAL WORK PERFORMED BY THE CONTRACTOR'S BIOLOGIST

Department. The Contractor shall prevent construction activity from displacing birds after they have laid their eggs and before the young have fledged.

3. If the Project continues into the following spring, this cycle shall be repeated. When Work on the structure is complete, the Contractor shall remove and properly dispose of netting used on the structure.

(d) *Taking of a Migratory Bird*

The taking of a migratory bird shall be reported to the USFWS and the Department. The Contractor shall be responsible for all penalties levied by the USFWS for the taking of a migratory bird.

(e) *Permission to Enter Property*

CDOT Form 730, *Permission to Enter Property*, shall be obtained by the Contractor to facilitate the wildlife biologist's ground surveys within adjacent property within 50 ft. of Work limits, where the Contractor's wildlife biologist has determined ground nesting bird habitat may be present. If Permission to Enter Property is denied by a property owner, the Contractor shall record the denial and place the record in the Project file to document that due diligence was pursued.

SECTION 250
ENVIRONMENTAL, HEALTH AND SAFETY MANAGEMENT

Section 250 of the Standard Specifications is hereby deleted for this project and replaced with the following:

DESCRIPTION

250.01 This work consists of protection of the environment, persons, and property from contaminants that may be encountered on the Project. This includes monitoring the work for encounters with contaminants or suspected soil and groundwater contaminants; the management of solid, special, and hazardous waste; and management of visual emissions associated with hazardous waste, when encountered on the project.

250.02 The Contractor shall furnish all personnel, materials, equipment, laboratory services and traffic control necessary to perform the contamination monitoring, testing, and site remediation when required. Traffic control shall be in accordance with the requirements of Section 630.

Monitoring equipment used to detect flammable gas, oxygen level, and toxic gas shall be capable of detection to meet the following standards:

Instrument Detection		
Constituent	**Threshold Limit**	**Increments**
Flammable Gas	1% LEL	1%
Oxygen	19%	0.1%
Toxic Gas	1 PPM	1 PPM
LEL = lower explosive limit PPM = parts per million		

CONSTRUCTION REQUIREMENTS

250.03 General. Prospective bidders, including subcontractors, are required to review the environmental documents available for this project included in Schedule 29 (*Reference Documents*).

This project is in the vicinity of property associated with petroleum products, heavy metal based paint, landfill, buried foundations, abandoned utility lines, industrial area or other sites which can yield Hazardous Substances or produce dangerous gases. These Hazardous Substances or gases can migrate within or into the construction area and could create hazardous conditions. The Contractor shall use appropriate methods to reduce and control known landfill materials, industrial gases, and visible emissions from asbestos encounters and hazardous substances which exist or migrate into the construction area. The Contractor shall follow CDOT's *Regulated Asbestos Contaminated Soil Management Standard Operating Procedure, dated October 20, 2016* for proper handling of asbestos-contaminated soil, and follow all applicable Solid and Hazardous Waste Regulations for proper handling of soils encountered that contain any other substance mentioned above.

Encountering suspected contaminated material, including groundwater, old foundations, building materials, demolition debris, or utility lines that may contain asbestos or be contaminated by asbestos, is possible at some point during the construction of this project. When suspected contaminated material, including groundwater, is encountered or brought to the surface, the procedures under subsection 250.03(d) and 250.05 shall be followed.

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SECTION 250
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Transportation of waste materials on public highways, streets and roadways shall be done in accordance with Title 49, Code of Federal Regulations (C.F.R.). All labeling, manifesting, transportation, etc. of waste materials generated on this project shall be coordinated with the Department. All hazardous waste manifests for waste materials generated on this project shall list the Colorado Department of Transportation as the generator of the waste materials except as otherwise noted. If the Contractor contaminates the site, the Contractor shall be listed as the generator on the hazardous waste manifests, permits, and other documents for such material.

If waste materials must be handled in a permitted treatment, storage and disposal (TSD) facility, the facility shall be coordinated with the Department. The hazardous waste transportation phase of the work involves insurance required by law and regulations. If the waste materials are determined to be hazardous, the Contractor must submit proof that the transportation company is covered by the appropriate type and amount of insurance required by laws and regulations governing the transportation of hazardous waste.

The Contractor alone bears the responsibility for determining that the work is accomplished in strict accordance with all applicable federal, state and local laws, regulations, standards, and codes governing special waste, petroleum and hazardous substance encounters and releases.

A Health and Safety Officer, Monitoring Technician, and Health and Safety Plan (HASP) are required in accordance with Section 23.21.2, 23.21.3 and 23.11 of Schedule 17, respectively.

(a) *Health and Safety Officer (HSO).* The Contractor shall designate a HSO in accordance with Section 23.21.2 of Schedule 17. The HSO can delegate task to their designee as long as the designee meets the training and certification requirements stated above for the HSO.

The HSO shall *be* equipped with the following:

1. Communication equipment as required in subsection 250.03(d)2.A. and a vehicle.

2. Monitoring and detection equipment for flammable gas, oxygen sufficiency, toxic gas, radiological screening and other hazards. This includes, as required, a combustible gas indicator, flame ionization or photo ionization detector, oxygen meter, radiation monitor with Geiger Mueller detector and other foreseeable equipment.

3. Depth gauging equipment, sampling equipment and sampling containers.

4. Personal protective equipment (PPE), when required. PPE must be selected which will provide protection from the specific hazards which are likely to be encountered during work on the project.

The HSO shall recommend and supervise those actions which will minimize the risk of Hazardous Substance related injury to the workers, Department personnel, the general public, property and the environment. The HSO shall prepare written procedures for the monitoring of confined space entry and working in or near excavations, including but not limited to trenches and drill holes associated with this project. The HSO shall ensure that all hazardous substance and solid waste related testing, sampling, monitoring and handling for this project to ensure compliance with applicable statutes

and regulations, and other applicable environmental requirements under subsections 107.01 and 107.02.

The HSO shall be available for consultation and assistance with contaminated materials related testing, sampling, and field monitoring as required on the project.

The HSO shall prepare a daily diary which shall be submitted to the Department on a monthly basis in the Monthly Statement of Recognized Hazardous Materials Management. The diary shall contain a chronological log of activities on the project including: dates and times on site, equipment used and calibrations, field monitoring results, visual observations, conversations, directives both given and received related to health and safety.

(b) *Monitoring Technician (MT).* The Contractor shall designate monitoring technicians to be responsible for monitoring of Hazardous Substances during work on the project in accordance with Section 23.21.3 of Schedule 17. The MT shall have a minimum of two years of actual field experience in assessment and remediation of hazardous substances that may be encountered during highway construction projects. The MT shall be experienced in the operation of monitoring devices, identifying substances based upon experience and observation, and field sampling (for testing) of all media that may be found on the site. Completion of the 40 hour hazardous waste and 8 hour supervisory training required by OSHA and U.S. EPA rules and regulations, which complies with the accreditation criteria under the provisions of the proposed 29 C.F.R. 1910.121 is required prior to beginning work. The Contractor shall furnish documentation at the Preconstruction Conference that demonstrates these requirements have been met.

The MT shall be equipped with the following:

1. Communication equipment as required in subsection 250.03(d)2.A. and a vehicle.

2. Monitoring and detection equipment for flammable gas, oxygen sufficiency, toxic gas, radiological screening and other hazards. This includes, as required, a combustible gas indicator, flame ionization or photo ionization detector, oxygen meter, radiation monitor with Geiger Mueller detector and other foreseeable equipment.

3. Personal protective equipment, when required. PPE must be selected which will provide protection from the specific hazards which are likely to be encountered during work on the project.

The MT shall be present on site and perform monitoring as required by 250.03(d) when work is being performed in areas of known or suspected Hazardous Substances.

The MT shall monitor for compliance with regulations, the project Health and Safety Plan and the Materials Management Plan, the Contract, and the environmental documents for the project. The MT shall immediately notify the Environmental Manager and the HSO of any hazardous condition.

(c) *Health and Safety Plan (HASP).* The HSO shall prepare a written HASP for the project focused on Hazardous Substances, formatted as shown in Appendix B, *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, DHHS (NIOSH) Publication Number 85-

115, available from the Superintendent of Documents, U.S. Government Printing Office, including all applicable sections from 29 C.F.R. 1910 and 29 C.F.R. 1926.

Within five calendar days after Acceptance by the Department, the HSO shall distribute signed and stamped (or sealed) copies of the accepted HASP to each emergency response agency servicing the project area and the HASP designated emergency hospital. Earth or demolition work

shall not occur until after the HASP is accepted and the HASP has been distributed. The HASP shall also be available to the Contractor's employees, their representatives, and officials of OSHA, EPA, Colorado Department of Public Health and Environment (CDPHE), local government health department, Federal Highway Administration, and other appropriate agencies, as requested. The Contractor will distribute the accepted HASP to appropriate Department personnel. The HASP shall be kept current and shall be revised by the HSO as warranted by changes in the field conditions.

All on-site workers (Contractor's, Department's, Utilities', and others) shall be briefed by the HSO on the contents of the HASP and any revisions thereof. The HSO shall conduct briefings (group or individual) to inform all new employees, subcontractors, utility companies and other on-site workers of the HASP contents prior to their entry on site. All personnel involved in excavation or other soil disturbing activities shall receive the required two-hour Asbestos Awareness training by a Certified Asbestos Inspector, when asbestos discoveries are anticipated, or discoveries are made.

A signature log of all briefing attendees shall be kept and provided in the Environmental Status Report (see Schedule 17, Section 4).

The Contractor shall provide, as required, eye wash equipment and stations, emergency showers, hand and face washing facilities and first aid equipment.

The Contractor shall provide, as required, decontamination facilities for personnel and equipment employed in the work. The exact procedure for decontamination and frequency shall be included in the accepted HASP. Decontamination facilities shall meet the criteria set forth in the Code of Federal Regulations (29 C.F.R. and 40 C.F.R.).

(d) *Precautions and Procedures.* The following minimum precautions and procedures shall be followed during the construction of the project:

1. General construction precautions:

A. All monitoring and piezometer wells and test borings shall be established or abandoned by the Contractor as regulated by the State Engineer's Office. Copies of all required permits, notification, and abandonment documents shall be submitted to the Department as part of the Monthly Statement of Recognized Hazardous Materials Management.

B. The Contractor shall properly handle all investigation derived waste generated by this project. Documentation shall be submitted to the Department as part of the Monthly Statement of Recognized Hazardous Materials Management of all tests performed for

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TSD determination; classification of waste; hauling records; TSD acceptance; manifest (if required); etc. in accordance with applicable laws and regulations.

2. For construction on a known or potentially contaminated site, the following conditions shall apply, in addition to those listed in subsection 250.03(d)1:

   A. The HSO, or their designee identified in the HASP, shall be on site or readily available by radio, telephone or pager at all times during the work. When on site, the HSO, or their designee identified in the HASP, shall have an operational portable or mobile

   cellular telephone available for immediate use in areas where such service is available. When on site in cellular telephone non-service areas, the HSO, or their designee identified in the HASP, shall have available, for immediate use, radio access to a site with telephone service. The HSO shall be notified at least 24 hours prior to the start of confined space entry, storage tank removal, drilling, excavation, trenching, or dewatering operations.

   B. The HSO shall designate the onsite monitoring equipment for flammable gases, oxygen deficient or enriched atmosphere, and toxic gases, such as but not limited to, a flame ionization detector, photoionization detector, combustible gas indicator, and oxygen meter. This designated equipment shall be on site during all construction operations and be utilized during trenching, drilling, excavating, confined space entry, underground storage tank removal, and other appropriate construction operations. The exact equipment to fulfill this requirement shall be specified in the accepted HASP. The HSO, or their designee identified in the HASP, shall conduct or supervise the monitoring. The monitoring equipment shall be calibrated as recommended by the manufacturer.

   C. When drilling, trenching, or excavating in the presence of detectable concentrations of explosive gases, the soil shall be wetted and the operating equipment shall be provided with spark proof exhausts.

   D. The Contractor, through the HSO, is responsible for ensuring that 29 C.F.R. 1926 is fully complied with during the construction of the project.

   E. Affected excavation operations shall be discontinued and personnel shall be removed from the affected excavation sites where any of the following levels are detected:

      (1) 20.0 percent or more LEL flammable gas, or 10.0 percent in an underground or confined space,

      (2) Permissible Exposure Limit (PEL) of any toxic gas,

      (3) 19.5 percent or less oxygen,

      (4) 25.0 percent or more oxygen,

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(5) Greater than 2 mrem/hr. (Beta particle & photon radioactivity),

(6) Greater than 15 pCi/L (Gross alpha particle activity), or

(7) Other action levels as determined by the HSO.

(8) Uncovering of suspect Asbestos Containing Material (ACM), including but not limited to, buried facility components, active or abandoned utility lines, buried foundations and demolition debris, or miscellaneous ACM dispersed in the soil. The Contractor shall follow the procedures outlined in the *CDOT's Regulated Asbestos Contaminated Soil Management Standard Operating Procedure, dated October 20, 2016*, HASP and 29 C.F.R. 1926 to address these conditions.

F. Personnel shall be issued and utilize appropriate Health and Safety equipment as determined by the HSO.

G. Personnel shall avoid the area immediately downwind of any excavation unless the excavation is monitored and declared safe.

H. The operators of excavating, trenching, or drilling equipment shall wear appropriate PPE as required in the HASP.

I. Exhaust blowers shall be present at the location where required in the accepted HASP.

J. The Contractor shall accomplish the work with employees who have been trained and equipped as required by the HASP and applicable provisions of 29 C.F.R. 1910 and 29 C.F.R. 1926.

K. Fire extinguishers, electrical equipment and wiring shall conform to the applicable requirements of 29 C.F.R. 1926 and 49 C.F.R..

L. Smoking shall not be permitted within 50 feet of any excavation.

3. For construction within 1000 feet of a known or potentially contaminated site, the following conditions, in addition to those listed in subsection 250.03(d) shall apply:

A. The areas under construction shall be checked with a combustible gas indicator before excavation begins to determine if flammable or combustible gas is in the area.

B. Excavations, trenches and drill holes shall be monitored by the HSO, or their designee identified in the HASP, for flammable gas, toxic gas and oxygen deficiency or enrichment. This shall be carried out continuously unless the presence of flammable, combustible or toxic gas, or oxygen deficiency or enrichment in the area can be ruled out by the HSO, or their designee identified in the HASP.

C. When flammable or toxic gas is found in the area, those precautions and procedures in subsection 250.03(d)2 shall apply.

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250.04 Heavy Metal Based Paint Management. When the work includes the removal of paint or items covered with paint which may contain lead, chromium or other heavy metals, the requirements of this subsection shall apply in addition to the requirements of subsection 250.03.

The requirements of the HASP shall be in accordance with OSHA Publication Number 3142, *Working with Lead in the Construction Industry.*

Paint Removal and Waste Disposal work shall be performed in accordance with 29 C.F.R. 1926.62, State and local air quality regulations, the Steel Structures Painting Council (SSPC) Guide for Containing Debris Generated During Paint Removal Operations, the *Industrial Lead Paint Removal Handbook* (SSPC 91-18), and the references contained therein.

The following minimum precautions and procedures shall be followed unless modified in the approved HASP or its updates:

The Contractor shall contact the CDPHE, Air Pollution Control Division to ascertain if an air pollution permit is required for the cleaning or demolition work. If an air pollution permit is required, the Contractor shall obtain the permit. The Contractor shall furnish the Department with a copy of the permit application and the permit issued prior to starting cleaning or demolition activities. A copy of the Air Pollution Emission Notice (APEN) shall be provided to the Department, if such notice is required under the Colorado Air Quality Control Commission's regulations. The processing of air pollution permits in non-attainment areas, or where public hearings are required, likely will take more than 90 days.

(a) The Contractor shall contain paint chips, corrosion residues, and spent abrasives, herein referred to as waste materials, resulting from the cleaning or demolition operations. The Contractor shall not deposit or release waste material into the water, air or onto the ground below or adjacent to the structure. The Contractor shall conduct cleaning operations to minimize the waste materials produced. Prior to beginning the work, the Contractor shall submit to the Department for acceptance, a detailed methods statement for capturing, testing, and disposing of the removed materials.

(b) Abrasives utilized for blast cleaning shall be low-dusting and low waste. Unless approved otherwise, vacuum blasting or wheel blasting shall be used.

(c) The Contractor shall sample and test the waste material for lead, chromium, and other paint associated heavy metals using the Toxicity Characteristic Leaching Procedure (TCLP) Test, Method 1311 of the EPA publication, Test Methods for Evaluating Solid Waste 846. Sample collection methodology and frequency shall be defined in the Sampling and Analysis Plan (see Section 23.10 of Schedule 17) with an adequate number of samples taken to be representative of all waste material collected. If the waste material does not pass the TCLP test, it shall be disposed of in a permitted TSD facility as designated in writing by the Department. The waste materials handling, including a description of sample collection methodology, testing performed, test results and comparison of test results with hazardous waste requirements shall be documented in the Monthly Statement of Regulated Hazardous Materials Management and Recognized Hazardous Materials Completion Report. The waste material shall not be held at an unpermitted TSD facility site in excess of Resource Conservation and Recovery Act (RCRA) temporary storage time limits.

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(d) When an item coated with paint is removed, all loose paint shall be removed and collected from the item within 24 hours of the time it is removed or placed onto the ground. All loose paint shall be removed and collected from a painted item before it is removed from the site. The Contractor shall contain loose paint until it is removed and collected. Loose paint is defined as that which can be removed by manual scraping methods. Over waterways, the Contractor shall capture all paint debris by the method specified in the methods statement. The paint debris shall be collected on a daily basis and shall be stored in a properly labeled, tightly sealed container and placed in a secured location at the end of each working day.

(e) All painted steel components which are not designated to be salvaged shall be recycled. Contractor possession of the steel for future use shall be considered a form of recycling. Prior to transport of the components off-Site, the Contractor shall obtain a letter from the recipients of the painted steel components stating that they have been fully informed of the contents of the paint and are capable of handling the paint. If the Contractor is to maintain future possession of the steel, the Contractor shall supply this letter. If there will be more than one recipient of the painted material, one letter shall be obtained from each recipient. The Contractor shall provide a copy of each letter to the Department. If the painted steel components will be recycled by melting, the letter from the recipient is not required. The Contractor shall submit a letter stating the destination of the painted steel components and that they will be melted.

(f) When the work consists of the removal of a bridge or components of a bridge coated with paint which has been assumed to contain lead, chromium, other heavy metals, or a combination thereof the Contractor shall capture paint debris which is dislodged during removal operations. The Contractor may choose any method for dismantling the bridge, subject to the following required construction sequence limitations:

1. The concrete deck shall be removed prior to removal of the steel superstructure.

2. If the methods statement indicates that girders will be dropped to the ground during dismantling, all debris from the concrete deck removal operation shall be removed from the area below the bridge before any girders are dropped into this area.

3. Girders may be cut and dropped only if the span is located entirely over land.

250.05 Material Handling. This work consists of the additional handling of groundwater and soils to be excavated for construction of the project which are suspected or known to be contaminated. This work also includes stockpiling or containerization, analytical sampling and testing, and final disposition of contaminated groundwater and soils requiring special handling.

There is the potential of encountering contaminated groundwater and soil, which has not been summarized in the plans or specifications, at unknown locations on the site. Suspected contaminated soil and groundwater shall be handled as follows:

(a) *Materials Handling (Stockpile& Containerization).* The Beneficial Reuse and Materials Management Plan defines the requirements for reusing soils on site. Health and safety monitoring and strict fugitive dust control shall be conducted during the placement of these soils. If analysis indicates that groundwater samples are designated as uncontaminated, as determined by the

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criteria shown in the Contract or as determined by the CDPHE, the groundwater shall be handled in accordance with subsection 107.25.

Stockpiled and containerized materials shall be secured in compliance with the following provisions until they are determined to be uncontaminated:

1. The Contractor shall not store the material for more than 90 days.

2. The Contractor shall prevent any runoff from infiltrating the ground or running out of the containment area.

3. Soils and groundwater containing different contaminants shall be placed in separate containers or stockpiles.

4. The Contractor shall prevent the dispersion of materials or the dilution or mixing of containers and stockpiles.

   The ground surface on which the contaminated soils will be placed shall be covered with plastic sheeting which will withstand the placement and removal of stockpiled materials without breaching. Alternatively, the Developer may place impacted soils, that are not saturated with any contaminant or water, on six inches of clean fill to eliminate the plastic sheeting. Upon final disposition of the stockpile, the six inches must be removed with the stockpile in accordance with the stockpile disposition; however, the disposal of the six inches of soil is considered incidental since it is a means and methods decision and shall not be included in any Supervening Event Submission.

5. The ground surface shall be graded to drain toward the edge of the soil piles and the berm or trench around them shall be covered by plastic sheeting.

6. Proper security shall be provided in accordance with 40 C.F.R..

(b) *Solid Waste Disposal.* Soils determined to be contaminated and not allowed to be reused on the project, but not hazardous, as established by criteria in the Contract or as determined by CDPHE or other regulatory agencies having jurisdiction, shall be handled and disposed of in accordance with all applicable Environmental Laws. The Contractor shall haul this material to a solid waste disposal facility.

(c) *Contaminated Groundwater Disposal*. Groundwater determined to be contaminated as established by CDPHE or other regulatory agencies having jurisdiction, shall be handled and disposed of in accordance with all applicable Environmental Law.

(d) *Hazardous Waste Disposal.* Soils and groundwater that are designated or suspected to be hazardous shall be containerized *immediately* upon excavation or upon discovery. Confirmed Hazardous Waste shall be labeled and transported to a permitted TSD facility or to a hazardous waste disposal facility approved by the Department.

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(e) *Additional Requirements.* Stockpiled or containerized material characterized as uncontaminated, contaminated or hazardous shall be stored and disposed of in a manner consistent with current established federal, state, and local regulations for waste materials.

Materials with contaminants not specifically regulated shall be disposed of by the Contractor as directed, in consultation with CDPHE. All areas where wastes are generated shall be reviewed by the Environmental Manager and HSO to identify potential contaminant sources that may result in a contaminated waste stream.

Contaminated groundwater and soils, which have been identified as solid waste or hazardous waste, requiring disposal according to federal, state, and local regulations, shall be transported in accordance with 49 C.F.R. by the Contractor to an appropriately permitted treatment facility, landfill, incinerator or asphalt plant or other facility approved to accept the waste. CDPHE and the landfill or other treatment or disposal facility shall be notified by the Environmental Manager or HSO of the material to be disposed of and the corresponding analytical test results prior to shipment, if required. Potentially contaminated water collected from the lined trench of a stockpile shall be treated as required by Colorado Wastewater Discharge Permit System (CDPS) permits, 29 C.F.R. and 40 C.F.R..

250.06 Sample delivery. This work consists of the collection, containerization and delivery of material samples for analysis to the testing facility designated in the Contract.

Environmental Protection Agency (EPA) protocol and standards shall be followed in the collection, containerization and transport of samples to be analyzed, including the documentation of the proper chain of custody of all samples. The Contractor shall collect sufficient sample material to perform the required analysis and is responsible for ensuring that appropriate climate control has been provided for sample transport. Sample delivery shall be made within the maximum allowable holding time for each sample type, not to exceed 24 hours, excluding weekends. The time period required for sample collection and delivery to the testing facility will not be considered an excusable delay.

The Contractor shall provide the Department with a copy of documentation indicating that proper chain of custody requirements have been followed for all samples.

The Department may request splits of samples, in advance of collection, which shall be provided at no additional cost by the Contractor.

250.07 Asbestos-Containing Material Management. Known or suspected locations that could involve encounters with ACM during excavation and other soil disturbing construction activities are identified in the (Reference Documents) (Schedule 29). Unexpected discoveries of ACM may be made during excavation and soil disturbing construction activities. When any discarded material is encountered that contains or consists of any of the following: construction, renovation and demolition debris (regardless of how it was generated), building or facility components, components of building systems (HVAC, plumbing, electrical, control, fire protection, roofing), components of pavement or drainage systems, industrial or machinery components, and/or mechanical components from motorized vehicles, the Developer shall conduct inspections in accordance with CDPHE Section 5.5 of the Solid Waste Regulations to determine whether such debris is regulated asbestos contaminated soil. Asbestos contaminated soil, shall be properly managed or remediated, in accordance with subsection 250.07(a) and

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the CDOT *Regulated Asbestos Contaminated Soil Management Standard Operating Procedure, dated October 20, 2016*.

All asbestos related activities shall be performed by Colorado certified asbestos professionals, contractors, or consultants. Certifications are issued by the CDPHE, Air Pollution Control Division. An appropriately certified professional shall manage the management and disposal of asbestos contaminated soil and other

ACM. The Air Pollution Control Division within CDPHE is the only unit that certifies such professionals. The Contactor shall furnish a copy of the license to the Department in the Environmental Status Report.

(a) *Regulatory Compliance.* Asbestos-contaminated soil management is governed by 6 CCR 1007-2, Section 5, which includes and references regulatory compliance with Asbestos Hazard Emergency Response Act (AHERA) Colorado *Regulation* 8. Inspection and reporting protocol and demolition standards are governed by AHERA. Demolition and notification standards are governed by National Emission Standards for Hazardous Air Pollutants (NESHAPS). Colorado Regulation 8 governs all asbestos abatement activities on facilities and facility components, demolition, permitting, and certification of Certified Asbestos Professionals in the State of Colorado. Colorado Regulation 8 is more stringent than AHERA and NESHAPS and supersedes federal regulations. Conflicting regulatory requirements between AHERA and NESHAPS, if not specifically addressed in Colorado Regulation 8, shall be addressed and approved protocol negotiated with CDPHE. The Contractor shall conform to all current regulations, policy directives, or both, issued by the EPA, CDPHE, and the Department.

(b) *Asbestos Management and Visual Inspections* Asbestos management must be performed by a certified asbestos professional in accordance with current regulations. Final Inspections of the area of asbestos-contaminated soil removal shall be performed by an appropriately certified asbestos consultant to determine what, if any, controls must be instituted to allow future activity in the excavation area. All final visual inspections shall be conducted only when soil is dry.

(c) *Permitting and Notification.* A 24-hour notification to CDPHE is required within 24-hours of any unexpected discovery of regulated asbestos containing soil during a soil disturbing activity and prior to implementation of CDOT's approved *Regulated Asbestos Contaminated Soil Management Standard Operating Procedure, dated October 20, 2016*. Removal of asbestos-containing material on a facility component, that is located on or in soil that will be disturbed, with asbestos quantities above the following trigger levels must be permitted and abated in accordance with the requirements of Air Quality Control Commission Regulation No. 8 (5 CCR 1001-10, Part B):

1. 260 linear feet on pipes,

2. 160 square feet on other surfaces, or

3. The volume of a 55-gallon drum.

All permit applications shall be submitted to the CDPHE a minimum of 10 days prior to start of work for approval. The permit application and notification shall be submitted simultaneously. The Contractor shall obtain all required State and local permits and shall be responsible for all associated fees.

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(d) *CDOT's Regulated Asbestos Contaminated Soil Management Standard Operating Procedure, dated October 20, 2016.* Asbestos contaminated soil shall be managed in accordance with 6 CCR 1007-2, Section 5, Asbestos Waste Management Regulations. The Contractor shall comply with procedures detailed in the CDPHE regulations as specified in 250.07 (a), and CDOT's approved *Regulated Asbestos Contaminated Soil Management Standard Operating Procedure, dated October 20, 2016*, including the following minimum requirements:

1. Immediate actions and implementation of interim controls to prevent visible emissions, exposure, and asbestos contamination in surrounding areas.

2. Soil characterization.

3. Training required for all personnel involved in excavation and other soil disturbing activities, when asbestos discoveries are anticipated, or discoveries are made. Asbestos Awareness Training shall be given by a qualified and Certified Asbestos Building Inspector with a minimum of six months experience inspecting asbestos contaminated soil and who otherwise meets the requirements of current regulations.

4. Assessment for the presence and extent, within the proposed area of disturbance, of potential asbestos discoveries, whether expected or unexpected, by a Certified Asbestos Building Inspector.

5. Investigation and sampling required for risk assessment and management. Investigation, if required, shall be conducted by a Certified Asbestos Building Inspector.

6. Risk assessment and determinations for further management or abatement.

   A. Risk assessment and determinations must be made by a Certified Asbestos Building Inspector.

   B. Soil remediation is not necessarily required, depending on the circumstances.

7. Submit 24-hour Notification of RACS Disturbance.

(e) *Risk Assessment and Determinations for Further Management Or Remediation.* Risk assessment and determinations for further management or remediation must be closely coordinated with the Department.

250.08 Methamphetamine Lab Sites. Demolition of former Methamphetamine (meth) labs is enforced by the Governing Authority, which varies from county to county. The Contractor shall demolish all buildings that are identified as former meth labs, as listed in public listings by the Governing Authority.

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The Contractor shall provide evidence of demolition to the Governing Authority, obtain receipt of such evidence by the Governing Authority, and shall submit these to Department immediately following demolition.

Septic tank removal at known meth lab sites shall undergo preliminary assessment by an Industrial Hygienist or Certified Industrial Hygienist to determine proper removal and disposal. Work shall proceed in accordance with the recommendations of the Hygienist.

Appendix B
Known Hazardous Substances Parcels

Parcel #
PE-197
AP-86, AP-86A, AP-86B
AP-91, AP-93, AP-93A
AP-96
AP-94
AP-88
AP-55
AP-52
IU

Railroad Parcel #
UPRR
AP-Construction License Permit 26
BNSF
AP-TE-90; AP-TE-90A
AP-PE-90; AP-PE-90A
DRIR
AP-136; AP-136B
AP-PE-136A

Appendix C
Groundwater Benchmark Concentrations

Analytical Suite	Analyte	Value (µg/L)
Dissolved Metals (Field Filtered)	Iron	8,400
	Manganese	2,500
Potentially Dissolved Metals (Preserved, Lab Filtered)	Arsenic	PL
	Cadmium	1.6
	Chromium (hexavalent)	61
	Chromium (Trivalent)	PL
	Copper	39
	Lead	18
	Manganese	2,755
	Nickel	PL
	Selenium	7.7
	Silver	PL
	Thallium	PL
	Uranium	PL
	Zinc	PL
Total Metals (Preserved, Unfiltered)	Aluminium	260,000
	Arsenic	64
	Barium	3,000
	Beryllium	16
	Cadmium	4.2
	Chromium	157
	$Chromium_{III}$	120
	$Chromium_{VI}$	62
	Iron	330,000
	Lead	235
	Molybdenum	PL
	Nickel	210
	Thallium	3.8
	Uranium	60
Volatile Organic Compounds	1,1,1-trichloroethane	PL
	1,1,2,2-tetrachloroethane	PL
	1,1,2-trichloroethane	PL
	1,1-dichloroethane	PL
	1,1-dichloroethene	35
	1,2-dichloropropane	25
	1,4-Dioxane	1.8
	2-Chloroethylvinyl ether	PL
	Acrolein	PL
	Benzene	50
	Bromoform	PL
	Bromomethane	PL
	Carbon tetrachloride	PL
	Chlorobenzene	PL
	Chloroform	PL
	cis-1,2-dichloroethene	700
	Ethylbenzene	PL
	Trichloroethene	50
	Tetrachloroethene	50
	Toluene	PL
	trans-1,2-dichloroethene	500
	Vinyl chloride	20
	Xylene Total	PL
Other	pH (Field, SU)	NL
	Nitrate (as N)	50,000
	TSS	NL

Analytical Suite	Analyte	Value (µg/L)
Semi-Volatile Organic Compounds	1,2,4-trichlorobenzene	PL
	1,2-dichlorobenzene	PL
	1,3-dichlorobenzene	PL
	1,4-dichlorobenzene	PL
	1,4-Dioxane	1.8
	2,4,6-trichlorophenol	PL
	2,4-dichlorophenol	PL
	2,4-dimethylphenol	PL
	2,4-dinitrophenol	PL
	2,4-Dinitrotoluene	PL
	2-chloronaphthalene	PL
	2-chlorophenol	PL
	4,6-Dinitro-2-methylphenol	PL
	4-nitrophenol	PL
	Acenaphthene	PL
	Anthracene	PL
	Benz(a)anthracene	2.5
	Benzidine	PL
	Benzo(a) pyrene	2.5
	Benzo(b)fluoranthene	2.5
	Benzo(g,h,i)perylene	2.5
	Benzo(k)fluoranthene	2.5
	Bis(2-chloroethyl)ether	PL
	Bis(2-ethylhexyl) phthalate	PL
	Butyl benzyl phthalate	PL
	Chrysene	2.5
	Dibenz(a,h)anthracene	2.5
	Diethylphthalate	PL
	Dimethyl phthalate	PL
	Di-n-butyl phthalate	PL
	Diphenylhydrazine	PL
	Fluoranthene	PL
	Fluorene	PL
	Hexachlorobenzene	PL
	Hexachlorobutadiene	PL
	Hexachlorocyclopentadiene	PL
	Hexachloroethane	PL
	Indeno(1,2,3-c,d)pyrene	2.5
	Isophorone	PL
	Naphthalene	PL
	Nitrobenzene	PL
	N-Nitrosodimethylamine	PL
	N-nitrosodi-n-propylamine	PL
	Pentachlorophenol	5.5
	Phenol	PL
	Pyrene	PL

Notes:

PL = Value set at the maximum permissible level (from time to time) under the applicable discharge Permit for the point of discharge.

µg/L = Concentrations in micrograms per liter.

NL = No Limit, Developer responsible for meeting discharge standard regardless of influent concentrations.

SU = pH values to be measured in standard units.

Schedule 18
Right-of-Way

1. General

1.1. Possession of the Right-of-Way

1.1.1. The Department shall provide Developer with Possession of each ROW Parcel, and any Additional ROW Parcels, pursuant to Section 7.2.1.b of the Project Agreement.

1.1.2. Set out in Appendix A to this Schedule 18 are all the ROW Parcels that the Department will acquire pursuant to the terms of this Schedule 18 and this Agreement. For certainty, Appendix A does not include any ROW Parcel that comprises part of the Existing CDOT Right-of-Way.

1.1.3. Developer shall be responsible for acquiring any Additional ROW Parcels, any Temporary Properties, and any Permit Areas, subject to the terms of this Schedule 18 with respect to any Additional ROW Parcels and to Section 8.4 of the Project Agreement with respect to any Permit Areas.

1.1.4. Developer shall also be responsible for acquiring all Temporary Easements, subject to the terms of this Schedule 18. Temporary Easements shall be acquired by the Developer where required for performing the Construction Work including for purposes of constructing driveway accesses to private properties where the Construction Work cannot be completed within ROW Parcels.

1.1.5. Except to the extent expressly provided in this Agreement, including in this Schedule 18, the Department shall not have any obligation, liability or responsibility with respect to the acquisition, Property Management, maintenance or disposition of, or otherwise with respect to any part of the Site.

1.2. Early Access and Use

1.2.1. Prior to the Project License Start Date for any ROW Parcel or any Additional ROW Parcel, Developer may from time to time submit written requests for the Department's Acceptance to visit, survey, investigate and inspect any such parcel for purposes of facilitating, and preparing for, Developer's performance of the Work. Developer shall submit any request pursuant to this Section 1.2.1 in such form, and accompanied by such materials (including a Permission to Enter Property Form), as the Department may require.

1.2.2. Developer may also from time to time submit written requests for the Department's Approval to enter any other property:

a. to which the Department is entitled to grant such permission to enter; and

b. that is not or will not be within a ROW Parcel or an Additional ROW Parcel,

for surveying, non-intrusive environmental investigation and appraisal purposes, and unless otherwise Approved by the Department, no other purposes, in each case using a Permission to Enter Property Form.

1.2.3. Developer shall submit any request pursuant to either Section 1.2.1 or Section 1.2.2 of this Schedule 18 no later than five Working Days prior to the proposed date of entry.

1.2.4. The Department's Acceptance or Approval, as applicable, of any Developer request submitted pursuant to either Section 1.2.1 or Section 1.2.2 of this Schedule 18 shall be subject to such conditions as the Department may require (in the case of an Acceptance, acting reasonably and, in the case of an Approval, in its discretion), and Developer having provided (or having procured that a Subcontractor has provided) satisfactory evidence to the Department that there is in place all necessary insurance coverage required by the Department in connection with such access and the activities Developer proposes to conduct during such early access and, as applicable, use. Developer, and not the Department, shall be responsible for any costs and expenses associated with Developer's satisfaction of the conditions required by the Department pursuant to this Section 1.2.4.

1.2.5. Developer shall be solely responsible for any and all damages and claims resulting from its access to any property pursuant to Sections 1.2.1 and 1.2.2 of this Schedule 18 and any activities performed during such access and, as applicable, use.

1.3. Acquisition of Right of Way by the Department

1.3.1. Set out in Appendix A to this Schedule 18 are all the ROW Parcels that the Department will acquire, exclusive of Temporary Property and Additional ROW Parcels which are, for certainty, the responsibility of Developer to acquire. The ROW Parcels that the Department will acquire include:

a. Selected total acquisitions of residential and commercial properties;

b. Partial acquisitions (including acquisitions in fee or for permanent easements);

c. Acquisitions of fee interests, permits, permanent easements, and/or Temporary Easement acquisitions from the Union Pacific Railroad (UPRR), Nestle Purina Petcare, NK Sharma, Paul and Maria Cristina Arrieta, Denver Rock Island Railroad (DRIRR), and Burlington Northern Railway Company (BNSF), along with properties adjoining the BNSF tracks, including Weakland Investments LLC, Manna Pro West, and Farmers Marketing Association; and

d. Right-of-way interests from the City of Denver.

1.3.2. Certain ROW Parcels to be acquired by the Department as set out in Appendix A to Schedule 18 specify under the column titled "Date First Available for Possession" that the date of Possession shall follow a notice from Developer. For such ROW Parcels, Developer shall, pursuant to Section 3.3 of this Schedule 18, provide the Department with a written request that the Department proceed with the acquisition of the identified ROW Parcel. The Department shall have no obligation to proceed with the acquisition and delivery of Possession of any such ROW Parcel unless and until it receives such a request (such request to be submitted no later than 18 months prior to the anticipated Substantial Completion Date (as determined by reference to the Project Schedule) together with Developer's design as available at the time of the notice or such other information with respect to such ROW Parcel supporting any such request as the Department may reasonably require.

1.4. Partial Acquisitions

1.4.1. The ROW Parcels set out in Appendix A to this Schedule 18 include certain partial acquisitions from the total ownership of properties depicted in the Right-of-Way Exhibits in Schedule 10B (*Contract Drawings*). The Right-of-Way Exhibits for private ownerships in Schedule 10B Contract Drawings depict entire ownerships of properties from which a partial acquisition will be needed. The maximum entire ownership has been identified in Schedule 10B Contract Drawings simply for identification purposes. Appendix A to this Schedule 18 identifies within each such entire ownership the maximum potential area (in square feet) (the "Maximum Square Footage") of each such partial acquisition.

1.4.2. With respect to such partial acquisitions identified in Appendix A to this Schedule 18 (for certainty, each of which shall be with respect to a specific ROW Parcel as set out in Appendix A to this Schedule 18) that are required by Developer for purposes of its design and performance of the Construction Work, the following will apply:

a. If Developer elects to have the Department acquire and deliver as a ROW Parcel any such partial acquisition, Developer shall give the Department notice to commence such acquisition. Any such notice shall be accompanied by a drawing and a CAD file clearly identifying the portion (which shall not exceed the Maximum Square Footage) of the relevant parcel that Developer is requesting that the Department acquire. Developer shall not be entitled to alter the limits of the elective partial acquisition as identified in the drawing and CAD file accompanying its notice to the Department after the initial submission of such notice.

b. If Developer gives any such notice, the Department will be responsible for acquiring the relevant partial acquisition as identified in Appendix A to this Schedule 18, provided that the Developer shall provide necessary design support to the Department and, to the extent reasonably practicable, the Developer shall assist the Department including through design optimizations and, at the Department's reasonable request, by using Reasonable Efforts to make certain design revisions to reduce material adverse impacts to property owners arising from any such partial acquisition. For such acquisitions, the Department will either compensate the property owner for existing site improvements that are impacted, or otherwise move or relocate them. According to the design requirements of CCD, the right-of-way boundary of the partial acquisition will typically be 6 inches from the back of the sidewalk.

c. In the event that:

i. any differences between Developer's design and the Reference Design;

ii. any differences between the design, construction, operations and/or maintenance means and methods Developer chooses for any portion of the Project and those set out, referred to or contemplated in any Governmental Approval (including, for certainty, any Department Provided Approval) or the application for the same;

iii. the incorporation of any ATC (as defined in the ITP) into this Agreement;

iv. the prior acquisition of any Additional ROW Parcel, Developer-risk Permit Area or any Temporary Property Rights; and/or

v. any breach of Law, Governmental Approval, Permit or this Agreement, fraud, willful misconduct, criminal conduct, recklessness, bad faith or negligence by or of any Developer-Related Entity,

requires the acquisition of additional property (including through an increase beyond the Maximum Square Footage of, or any other material adverse impact arising from, such partial acquisition), such additional property shall be acquired by Developer as Additional ROW Parcels, Developer-risk Permit Areas and/or Temporary Property Rights and not, for certainty, by the Department as a partial acquisition.

d. Special Provisions for ROW Parcel RW-103

i. As an additional condition precedent to the Department's commencement of any partial acquisition of the ROW Parcel identified as RW-103 in Appendix A to this Schedule 18 (the "Safeway Parcel"):

A. any notice given by Developer pursuant to Section 1.3.2.a of this Schedule 18 shall be accompanied by a CAD file of the design and proposed line work;

B. Developer shall have prepared its design in compliance with Section 9.4.15 of Schedule 10 (*Design and Construction Requirements*) as it relates to design exception DE-3 as listed in Table 9-1 of Schedule 10 (*Design and Construction Requirements*) (a copy of which is in the Reference Documents); and

C. in addition, the Department shall be reasonably satisfied that Developer's design with respect to the Safeway Parcel shall result in: (1) the elimination of impacts to property occupant Safeway's security building; (2) avoidance of any impacts to property occupant Safeway's queuing operations for incoming and outgoing transport vehicles at the northeast corner of the property near Dahlia Street; and (3) minimization of the loss of parking along the north boundary of the Safeway Parcel.

ii. Developer shall be responsible, as part of the Construction Work, for the rectification of the following property impacts to the Safeway Parcel that result from any partial acquisition of such parcel:

A. removal of the existing on-site drainage facilities including a separate detention pond and containment pond in the northwest portion of the Safeway Parcel. The containment pond shall be replaced separately from and adjacent to the detention pond southeast of the Colorado Boulevard interchange as depicted in the Reference Documents. Developer shall be responsible for temporary water quality requirements associated with all Construction Work associated with the rectification of the Safeway Parcel;

B. removal of property occupant Safeway's parking lot and all other private improvements located within the partially acquired portion of the Safeway Parcel;

C. replacement of driveways and access; and

D. removal and replacement of any landscape/irrigation systems.

iii. Subject to Developer's compliance with the foregoing, the Department will be responsible for compensating the owner of the Safeway Parcel for the replacement of the loss of parking spaces as a result of the Construction Work.

iv. Any Construction Work required outside of the boundary of the partial acquisition that the Department will acquire shall be completed under a Temporary Easement.

e. Special Provisions for ROW Parcel AP-TE-170

i. The partial acquisition of the ROW Parcel identified as AP-TE-170 in Appendix A to this Schedule 18 is being acquired by the Department to facilitate the use and construction of a shoofly for UPRR-related improvements. Without limiting its other obligations with respect to such ROW Parcel under this Schedule 18 and this Agreement, Developer shall promptly, following the Project License Start Date with respect to such ROW Parcel, construct a fence and coordinate with the property owner regarding the location, type, and height of fence. The Developer shall reasonably accommodate the property owner's requested fence type.

ii. The Developer shall obtain, prior to initiation of any Construction Work within AP-TE-170, a structural engineering report, performed by a licensed professional structural engineer, which shall be used as a baseline condition report for purposes of this Section 1.3.2.e.ii of this Schedule 18. After all Construction Work within AP-TE-170 is complete and the area has been restored, the Developer shall obtain an updated structural engineering report performed by a licensed professional structural engineer. The Developer shall pay the property owner for the cost to cure any structural damage to the owner's building improvements as such damage is identified in the updated structural engineering report.

f. Special Provisions for ROW Parcel AP-PE-92

The ROW Parcel identified as AP-PE-92 is being acquired as a partial acquisition by the Department, in part, to facilitate construction of drainage improvements. The Developer shall remove, and replace in kind, any portion of the fence located on such parcel that is impacted by the Construction Work.

1.5. ROW Manager

A ROW Manager shall be retained by Developer if Approval of Additional Right-of-Way or Temporary Easement acquisition by Developer is requested of the Department pursuant to Section 3.3 of this Schedule 18. Developer's ROW Manager shall be responsible for all of

Developer's acquisition and relocation coordination and compliance requirements pursuant to this Schedule 18. Developer's ROW Manager shall be qualified and Approved by the Department for both acquisition and relocation activities.

1.6. Tracking of Developer Responsibilities

1.6.1. For Additional Right-of-Way and Temporary Easement acquisitions and Property Management Activities that are the responsibility of Developer pursuant to this Schedule 18, Developer must establish, and provide the Department with, a project tracking and Quality Control/Quality Assurance system, the form and substance of which is subject to the Department's Acceptance, provided that, at Developer's discretion, such system may be either in the form of specialized spreadsheets or a proprietary software program.

1.6.2. The project tracking and Quality Control/Quality Assurance system must show the status of field survey, ROW plans, appraisal and appraisal review, acquisition, relocation, property management and Quality Control/Quality Assurance status for all ROW Parcels, Additional ROW Parcels and Temporary Easements.

2. Property Management

2.1. Property Management – General

2.1.1. Property Management activities include responsibility for acquired properties after acquisition and relocation has been completed and possession has been obtained, as such responsibilities are described in Chapter 7 of the CDOT Right of Way Manual, including:

a. Regular inspection and securing of properties to prevent and/or detect damage or unauthorized occupancy;

b. Installation of security fencing;

c. Identification, investigation, removal, treatment, storage, transportation, management and/or disposal of Hazardous Substances present on or in any building, bridge, or structure, including any subsurface structure or facility connected to any such building, bridge or structure and underground storage tanks that are registered with the Division of Oil and Public Safety, which Hazardous Substances shall not, for certainty, at any time constitute Unexpected Hazardous Substances;

d. Preparing Structure Survey Assessment Reports ("SSAR") as defined in Section 23.13.2 of Schedule 17 (*Environmental Requirements*);

e. Disconnecting Utilities;

f. Boarding-up properties;

g. Preparation of a Stormwater Management Plan ("SWMP");

h. Installation of the SWMP improvements as required by the SWMP;

i. Building or other structural demolition; and

j. Miscellaneous maintenance if temporarily necessary,

(all such activities and responsibilities, "Property Management").

2.2. Property Management Activities and Responsibilities

2.2.1. Subject to Section 2.2.2 of this Schedule 18 and the terms of this Agreement:

a. Developer shall be responsible for all Property Management activities for:

i. all ROW Parcels and any Additional ROW Parcels, with effect from the applicable Project License Start Date; and

ii. any Temporary Easements, with effect from the Calendar Day on which Developer first has the benefit of such easement; and

b. to the extent Chapter 7 of the CDOT Right of Way Manual identifies CDOT as the responsible party for specified Property Management activities, Developer shall take the place of CDOT in performing, and being fully responsible for, such activities to the extent Developer is responsible for such activities pursuant to Section 2.2.1.a of this Schedule 18.

2.2.2. To help expedite the early availability to Developer of ROW Parcels set out in Appendix A to this Schedule 18 that the Department intends to acquire before the date of issuance of NTP1, the Department will assist Developer by undertaking, subject to Section 2.2.3 of this Schedule 18, (a) Property Management activities for those parcels that are identified in Appendix A to this Schedule 18 as being subject to Department Property Management and (b) the limited Property Management activities identified in the footnotes to Appendix A to this Schedule 18 for those parcels identified therein as being subject to "Limited PM" by the Department. The Department shall complete Property Management activities for which it is responsible pursuant to this Section 2.2.2 (for certainty, excluding such activities as are by their nature ongoing at the Project License Start Date) no later than the Project License Start Date with respect to each such ROW Parcel. For certainty, completion of such activities shall include completion of Property Management comprised of building or other structural demolition.

2.2.3. The Department's obligations under Section 2.2.2 of this Schedule 18 shall not include:

a. without prejudice to Developer's rights and obligations arising as a result of the occurrence of any Supervening Event, any responsibility or liability for any identification, investigation, removal, treatment, storage, transportation, management and/or disposal of Hazardous Substances present on or in any soil or groundwater or on or in any subsurface structures that are not connected to a surface structure, or any underground storage tanks that are not registered with the Division of Oil and Public Safety;

b. with respect to the parcels identified in Appendix A to this Schedule 18 as being subject to "Limited PM" by the Department, any Property Management activities that are expressly identified as being Developer's responsibility in the footnotes in respect of such parcels; or

c. any Property Management activities that are required as a result of:

i. any differences between Developer's design and the Reference Design;

ii. any differences between the design, construction, operations and/or maintenance means and methods Developer chooses for any portion of the Project and those set out, referred to or contemplated in any Governmental Approval (including, for certainty, any Department Provided Approval) or the application for the same;

iii. the incorporation of any ATC (as defined in the ITP) into this Agreement;

iv. the acquisition of any Additional ROW Parcel, Developer-risk Permit Area or any Temporary Property Rights; and/or

v. any breach of Law, Governmental Approval, Permit or this Agreement, fraud, willful misconduct, criminal conduct, recklessness, bad faith or negligence by or of any Developer-Related Entity.

2.2.4. Developer shall also prepare and submit to the Department for Acceptance a Property Management Plan, which plan shall comply with the Materials Management Plan. The Property Management Plan shall establish administrative and technical means for Property Management, including the security, Hazardous Substances assessment, demolition, debris removal, site clearing, storm water management improvements, and clean-up of building structures and property improvements acquired as part of any ROW Parcel set out in Appendix A to this Schedule 18, any Additional ROW Parcel or any Temporary Easement. The Property Management Plan shall specify how Developer's Property Management activities will conform to Chapter 7, Property Management, of the CDOT Right of Way Manual. The Property Management

Plan shall incorporate the Structure Survey Assessment Plan ("SSAP") (as defined in Section 23.13.2 of Schedule 17 (*Environmental Requirements*)) with respect to the procedures for completing building and structure surveys for asbestos containing building materials ("ACBM"s), lead-containing paint ("LCP"), lead-based paint ("LBP"), and universal wastes or other RHM (e.g., "Hazardous Waste" as defined by the Resource Conservation and Recovery Act; "Universal Wastes" as defined by the EPA and Part 273 of the Colorado Hazardous Waste Regulations; chlorofluorocarbons as defined by the Clean Air Act; and polychlorinated biphenyls as defined by the Toxic Substances Control Act). The Property Management Plan shall be submitted to the Department for Acceptance no later than 60 Calendar Days after the date of issuance of NTP1. In addition, when Developer receives Approval from the Department to acquire Additional ROW Parcels or Temporary Easements pursuant to Section 3.3 of this Schedule 18, the Property Management Plan will be updated by Developer, subject to the Department's Acceptance, to include any such Additional ROW Parcels and/or Temporary Easements in the plan.

2.2.5. Environmental Site Assessments

The Department has obtained, and made available as Reference Documents, Phase I Environmental Site Assessments ("ESAs") for each parcel set out in Appendix A to this Schedule 18. Any such ESA shall be considered to be Project Information for purposes of Section 3.1 of the Project Agreement.

2.3. Property Management – Demolition

2.3.1. Demolition by Developer as part of its Property Management activities or the Construction Work shall not commence until:

a. The relevant date specified in Section 2.2.1.a.i or ii, as applicable, of this Schedule 18;

b. Structure Survey Assessment Reports ("SSAR"s) as defined in Section 23.13.2 of Schedule 17 (*Environmental Requirements*) and historic Level II documentation as defined in Section 12 of Schedule 17 (*Environmental Requirements*) has been completed and all abatement of identified RHMs in and on such buildings or structures has been completed including the submittal of the Structure Survey Completion Report ("SSCR") as defined in Section 23.13.9 of Schedule 17 (*Environmental Requirements*), improvements have been boarded up, all Utilities have been disconnected, all SWMP improvements are in place, and all necessary Governmental Approvals and Permits have been obtained, including, as applicable, a demolition permit from the City of Denver (requirements of which include proof of notification of adjoining property owners, disconnection of utilities, written verification of termination of utility service, and proof of approval from CDPHE) and/or the CDPHE, as applicable, all in accordance with the Environmental Requirements. Developer shall also obtain a Demolition Plan Accepted by the Department in accordance with the Occupational Health and Safety Administration (OSHA) demolition regulations 1926.850 prior to demolition of any buildings or other structures. Such documentation shall be submitted to the Department for Acceptance at least 15 Working Days prior to proposed demolition; and

c. Should newly identified impacts to historic resources result in a determination of adverse effect pursuant to 36 CFR § 800.5, Developer has completed historic Level II documentation as defined in Section 12 of Schedule 17 (*Environmental Requirements*).

2.3.2. All such demolition must be completed prior to commencing any Construction Work (other than preparatory activities for such demolition, the demolition itself, and non-intrusive inspections of the relevant buildings or structures). If such demolition is not immediately completed for any reason, Developer shall be responsible for all ongoing Property Management for any existing improvements until demolition is completed.

3. Additional Right-of-Way, Temporary Easements, and Permits

In the event Developer requests parcels of land in addition to the ROW Parcels for any reason, including to accommodate its design, and the Department Approves such request, Developer shall be responsible for such acquisitions and such parcels, as acquired, shall be Additional ROW

Parcels. All Additional Right-of-Way shall be held or acquired pursuant to Section 7.3.1 of the Project Agreement and this Section 3 of this Schedule 18.

3.1. Acquisition and Relocation Standards

3.1.1. To the extent permitted by this Schedule 18, all activities related to acquisition of Additional ROW Parcels, Temporary Easements and Permit Areas and the relocation of displaced occupants or personal property shall be performed by Developer in accordance with Law and applicable procedures, including (as applicable):

a. The Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended (the "Uniform Act"), including regulations promulgated pursuant to such Act, which appear at 49 CFR Part 24;

b. Right-of-Way Requirements for Design/Build Projects, 23 CFR § 710.313;

c. The Colorado Relocation Assistance and Land Acquisition Policies Act, §§ 24-56-101, et seq., C.R.S.;

d. The Colorado Eminent Domain Act, §§ 38-1-101, et seq., C.R.S.;

e. The most recent CDOT Right of Way Manual;

f. The requirements of Appendices B and C to this Schedule 18; and

g. All applicable procedural requirements required in connection with Department of Transportation, State of Colorado v. Amerco Real Estate Co. (2016 CO 62. No. 16SA75), including approval by the Transportation Commission of any Additional ROW Acquisition.

3.1.2. In relation to any acquisition of Additional ROW Parcels, Temporary Easements and Permit Areas, and the relocation of displaced occupants or personal property, all appraisal, acquisition, negotiation, and relocation activities shall be performed as applicable by consultants or Developer staff or Subcontractors that have been Approved by the Department for such purpose, subject to the Department's Acceptance of Developer's support documentation for such activities.

3.2. General Requirements Before Developer Can Initiate Acquisition of Additional Right-of-Way

If Developer identifies any:

a. Additional ROW Parcel that is permanently needed to construct or maintain the Project;

b. Additional Right-of-Way otherwise necessary to meet the Technical Requirements;

c. Additional rights beyond those which Developer otherwise has or will have under the Project License in relation to any part of the Right-of-Way or any previously acquired Additional ROW Parcel; or

d. Permits to be issued, granted or entered into by or with any Railroad or the Regional Transportation District to provide Developer with a Developer-risk Permit Area,

then it shall only take any action to secure or acquire access to or any interest in any such Additional ROW Parcel, Permits, or additional rights with the Transportation Commission's approval (and, in the case of any such Permits, otherwise pursuant to Section 8.4 of the Project Agreement) and also:

e. Ensuring that any Additional ROW Parcels or additional rights shall be held or acquired, as applicable, pursuant to Section 7.3.1 of the Project Agreement;

f. Paying or committing to pay all the Department's and the State's costs and expenses, provided that, in paying all such costs and expenses, Developer is not acquiring, and shall not be deemed to be acquiring, any interest in real property for Developer; and

g. Agreeing to bear the risk of any time and cost impacts to the Work related to securing or acquiring access to or any interest in such Additional ROW Parcel or additional rights.

3.3. Request for Additional Right-of-Way and Temporary Easements

3.3.1. In accordance with 23 CFR § 710.313(d)(1)(i), Developer must submit written acquisition and relocation procedures to the Department for Approval prior to commencing right-of-way activities for the acquisition of Additional ROW Parcels and Temporary Easements. These procedures shall contain a prioritized appraisal, acquisition and relocation strategy as well as check points for the Department's Acceptance, such as the Department's determination of just compensation, replacement housing payment calculations, replacement housing payment and moving cost claims, appraisals, administrative and stipulated settlements that exceed determined thresholds based on a risk management analysis, etc.

3.3.2. Each initial request submitted by the Developer pursuant to Section 3.3.1 of this Schedule 18 shall include the following documentation:

a. Copies of Developer's latest design files;

b. Identification of each Additional ROW Parcel as being a total acquisition or partial acquisition either in fee or for a permanent easement, or Temporary Easement (where an illustration of each parcel superimposed on an aerial photograph with approximate area of the parcel will be sufficient), and an explanation of a justification for its need;

c. Identification of Developer-risk Permit Areas for which Developer must obtain Permits from Railroads or the Regional Transportation District; and

d. A preliminary cost estimate for each parcel that includes separate values for land, improvements, damages or benefits (if any), relocation (if applicable), and survey, Right of Way Plan preparation, appraisal, and acquisition costs. This information is not applicable to, or necessary for, Permits.

3.3.3. The Department will review the information provided with the Developer's initial request. If such information is Accepted by the Department, then the Department will inform the Developer in writing that it may proceed to prepare final documents for approval by the Transportation Commission as provided in Section 3.3.4 of this Schedule 18. If the Department's staff identifies any deficiencies in the information provided with the initial request, the Department will identify such deficiencies in writing to the Developer, and the Developer may re-submit its initial request for Acceptance.

3.3.4. Following the Department's Acceptance of Developer's initial request, as a condition precedent to the Department submitting to the Transportation Commission a request to approve the Developer's request for the acquisition of Additional ROW Parcels or Temporary Easements, the Developer must provide the Department with the following additional documents:

a. Final ROW plans, prepared in compliance with CDOT's Right of Way Manual, which have undergone a ROW Plan Review meeting by the Department's survey staff, with requested modifications made and Accepted by the Department's survey staff;

b. A Chief Engineer's ROW Cost Estimate using CDOT Form #0438;

c. A Chief Engineer's report, using the Department's pre-approved form for such report.

d. A proposed resolution for the Transportation Commission, in a form reasonably acceptable to the Department, for the Transportation Commission to approve the ROW plans and initiation of acquisition of the identified properties; and

e. Any additional information or documentation that the Transportation Commission may require for it to consider the request for approval.

3.3.5. Any financial settlement over the amount of the Fair Market Value ("FMV") that is tentatively reached between the Developer and the property owner of the property that is the subject of the potential acquisition of an Additional ROW Parcel or Temporary Easement, regardless of the amount of such settlement, must also be approved by the Department as set forth in the CDOT Right of Way Manual.

3.4. Acquisitions of Additional Right-of-Way and Temporary Easements

3.4.1. If written Approval is obtained from the Department pursuant to Section 3.3 of this Schedule 18, Developer may begin the process for the acquisition of the proposed Additional ROW Parcel and/or Temporary Easement at its own cost and expense. Such process includes the activities required to be performed pursuant to this Section 3.4 and as set out in Appendix B to this Schedule 18.

3.4.2. All aspects of Developer's process for property acquisitions under this Schedule 18 shall be conducted in compliance with: (1) Appendix B to this Schedule 18 and the CDOT Right of Way Manual, including Right of Way Plan preparation, appraisal and acquisition; and (2) pursuant to Section 3.2 of this Schedule 18, all requirements of the Transportation Commission relating to the approval of ROW items and processes, including ROW plan preparation, cost estimate for acquisition of ROW and initiation of condemnation proceedings (if needed). The appraisal review function pursuant to the CDOT Right of Way Manual, including the issuance of a Determination of FMV, is solely the Department's responsibility.

3.4.3. The Developer may proceed with the acquisition, negotiation, and relocation process for property acquisitions under this Schedule 18 only after:

a. approval by the Transportation Commission of the ROW plans, cost estimate for the acquisition of right of way, and any other required information; and

b. issuance of a waiver valuation or FMV by the Department.

3.4.4. For any fee parcels acquired as Additional Right-of-Way, Developer shall obtain and provide appropriate release documents for any encumbrances affecting the acquisition parcels, including but not limited to releases of deeds of trust, mortgages, easements, and liens. If liens or encumbrances affect permanent easement parcels being acquired as Additional Right-of-Way, the Department will be notified of such liens and encumbrances and Developer will be required to take the action requested by the Department with respect to such liens and encumbrances, including subordination or release of the liens and encumbrances. An appropriate environmental clearance, as specified in Schedule 17 (*Environmental Requirements*), shall be required as a prerequisite for Approval of Right of Way Plans for any Additional ROW Parcel.

3.4.5. If the proposed Additional ROW Parcel or Temporary Easement is to be acquired from a landowner with whom the Department has an unsettled acquisition case, Developer shall ensure that, to the extent possible, the same appraiser that prepared the appraisal for the Department shall value the proposed Additional ROW Parcel or Temporary Easement. The Department is responsible to review such additional appraisal and issue a FMV in its discretion. No offer can be made to such property owner until such FMV has been issued. For any administrative settlement, the Developer must obtain the Approval of the Department as required by the CDOT Right of Way Manual. Administrative settlements are settlements over the amount of the Department's Approved offer to purchase that are made to the landowner.

3.4.6. If authorization is obtained from the Department for the purchase of any Additional ROW Parcel and/or Temporary Easement, Developer's ROW Manager shall meet with the Department, every two weeks, to review the status of the acquisition and relocations and confirm that Quality Control/Quality Assurance measures have been followed. Such periodic reviews will continue until the completion of the acquisition, any related relocation, and Department's Approval of the acquisition and relocations. At such periodic status meetings, Developer shall provide the Department with up-to-date reports from Developer's tracking and Quality Control / Quality Assurance system as established pursuant to Section 1.5 of this Schedule 18 on the status of ROW plan preparation, appraisal and appraisal review, acquisition, relocation and property management activities.

3.5. Relocation

3.5.1. For Additional ROW Parcels and any Temporary Easements that may be necessary for total and partial acquisitions, either in fee or for permanent easement, acquired by Developer pursuant to

this Schedule 18, Developer shall relocate any occupants and personal property in accordance with the Uniform Act and the CDOT Right of Way Manual.

3.5.2. If the acquisition of any Additional ROW Parcel or Temporary Easement requires occupant or personal property relocation, such relocation shall be conducted in compliance with Appendix C of this Schedule 18 and Chapter 5 of the CDOT Right of Way Manual. Developer shall also comply with the requirements of 23 CFR § 710.313(d)(1)(i) as well as 23 CFR § 710.313(d)(1)(ii), which specifies that Developer's written relocation plan must provide reasonable time frames for the orderly relocation of residents and businesses as provided at 49 CFR § 24.205. These time frames will be based on best estimates of the time it will take to acquire such Additional ROW Parcel or Temporary Easement and relocate families in accordance with certain legal requirements and time frames, which may not be violated. Accordingly, the time frame estimates in Developer's relocation plan for the acquisition shall not be compressed in the event that other necessary actions preceding acquisition miss their assigned due dates.

3.5.3. Without limiting Developer's obligations to comply with Chapter 5 of the CDOT Right of Way and 23 CFR § 710.313(d), Developer shall follow the procedures set out in Appendix C to this Schedule 18 with respect to any occupant or personal property relocation conducted in connection with any acquisition under Section 3.5 of this Schedule 18.

3.6. Condemnation

3.6.1. If Developer cannot reach an agreement with a landowner for the acquisition of an Additional ROW Parcel or a Temporary Easement, Developer may submit in writing a request for Approval from the Department that it acquire the Additional ROW Parcel or Temporary Easement through condemnation proceedings by the Department. In connection with such request, the Developer will prepare for the Department all necessary documentation necessary to submit such request to the Transportation Commission for approval.

3.6.2. The Developer is responsible for sending notices, the form of which shall be approved by the Department, using the Department's pre-approved form, to the impacted property owner informing them of the Transportation Commission meeting date at which the property will be considered for authorization of condemnation. Such notices must have been sent to each property owner at least 10 Calendar Days before the Transportation Commission meeting.

3.6.3. Any exercise by the Department of its condemnation rights shall be at the discretion of the Department and the Transportation Commission. If the Department agrees to exercise such rights, the State Attorney General's Office will file and prosecute all condemnations needed for any such acquisition.

3.6.4. Any request by Developer pursuant to Section 3.6.1 of this Schedule 18 shall include the submission to the Department for Approval of a properly completed "Condemnation Memorandum" and "Check List Form" in accordance with the instructions contained in the CDOT Right of Way Manual. The condemnation request shall include a certified check payable to the Clerk of the District Court of the appropriate county in the amount of any required condemnation filing fee and the determination of fair market value or value finding.

3.6.5. Developer shall work with the Department to establish a realistic schedule for filing condemnations, and setting and holding immediate possession hearings, which schedule must be Approved by the Department. If a settlement is negotiated with a property owner after the filing of a condemnation, Developer will be consulted on the settlement, provided that the Department shall have discretion to decide whether to Accept the settlement. If a settlement is Accepted by the Department, Developer shall pay the full amount of the settlement. If a valuation trial is held, Developer shall be responsible for payment of the full amount of the valuation trial award, including, if any, all interest, costs and attorneys' fees per C.R.S. 38-1-122, expert witness fees, court reporter, compensation for commission members, court costs, and any other associated costs not identified herein. The Department may require Developer to provide personnel for pre-trial and court testimony for any condemnation request made by it pursuant to Section 3.6.1 of this Schedule 18.

3.6.6. Notwithstanding the foregoing, Developer does not and shall not have any power to file or prosecute condemnations or otherwise exercise any power of eminent domain, and neither the Enterprises nor the Department shall have any obligation to exercise, or to seek or secure the exercise, by any other Governmental Authority (including the State Attorney General's Office) of the same.

3.6.7. If there are any time delays as a result of condemnation proceedings, regardless of whether the Department or Developer was responsible for the particular acquisition, all costs and schedule implications associated with such time delays shall be borne by Developer.

3.7. Developer Possession of Acquired Properties

No later than 5 Working Days prior to the tender of payment to the property owner of the acquisition price in respect of any Additional ROW Parcel or Temporary Easement, Developer shall submit for the Department's Acceptance a complete parcel acquisition file, which shall include copies of offer letters, FMV determinations or value findings, fully executed easement documents and/or agreements, the negotiator's signed diary, and, if relocation was applicable, all required relocation forms. The submittal of a parcel acquisition file shall also include a confirmation that a Quality Control/Quality Assurance review was completed on the file before submittal to the Department. Developer shall not access or take possession of any Additional ROW Parcel or Temporary Easement until the Department provides written authorization.

3.8. Delegations to Department

3.8.1. Notwithstanding any other provision of this Schedule 18, and subject always to compliance with Law, Developer and Department may, in their individual discretion, agree that the Department shall perform, at Developer's cost and expense, any of Developer's obligations under this Schedule 18 with respect to Additional ROW Parcel and Temporary Easement acquisition activities, including Right of Way Plan preparation, appraisal, acquisition, and relocation activities.

3.8.2. If the Developer elects, and the Department agrees, to have the Department acquire Additional Right-of-Way and/or Temporary Easements that are the Developer's responsibility under this Schedule 18, and if such acquisitions are from property owners from whom the Department intends to acquire (but has not yet acquired) a partial acquisition ROW Parcel interest as specified in Appendix A of this Schedule 18, the Developer shall provide the Department with a written request for these additional acquisitions at the same time the Developer notifies the Department, pursuant to Sections 1.4 and 1.3.2 of this Schedule 18, to begin the Department's acquisition process for a partial acquisition from the same property owner.

3.8.3. If the Parties agree that the Department shall undertake any such Additional ROW Parcel and Temporary Easement activities on Developer's behalf, the Department will provide Developer with an estimated cost to perform the work and anticipated approximate delivery schedule. Developer shall be responsible for any increased costs that may result from a delay in obtaining possession and completion of relocation for any Additional ROW Parcel or Temporary Easement acquired by the Department at the request of Developer pursuant to this Section 3.8.

3.8.4. Notwithstanding the foregoing, in the event that the Department undertakes any activities on behalf of Developer pursuant to this Section 3.8, Developer shall remain responsible for all Property Management activities in relation to any relevant Additional ROW Parcels or Temporary Easements.

3.9. Reinstatement

3.9.1. At the applicable Project License End Date, each ROW Parcel, Additional ROW Parcel and Temporary Easement shall be returned by Developer to the owner or interest holder in the condition required pursuant to the Technical Requirements, and otherwise in the same condition it was in prior to taking Possession (after taking into account required Property Management activities).

3.9.2. Developer shall, at its sole cost and expense:

a. Undertake all activities necessary to comply with Section 3.9.1 of this Schedule 18 (including, with respect to the ROW Parcels (or any part thereof) on which the Maintenance Yard is located, demolition of any structures built by Developer (except to the extent the Enterprises waive such requirement in writing) and remediation of any Hazardous Substance contamination resulting from Developer's use and occupancy of the Maintenance Yard); and

b. Repair and/or replace or restore any damage to such properties that may occur as a result of Developer's occupancy, to a condition reasonably equal to that existing prior to the damage.

3.9.3. Restoration activities undertaken pursuant to Section 3.9.2 of this Schedule 18:

a. May include repair, replacing in kind, rebuilding, or replanting; and

b. Must be completed by the Project License End Date with respect to the relevant property.

4. ACCESS PERMITS

4.1. Developer to become member of Notification Association

a. Developer shall at NTP2 become, and at all times during the Term shall remain, a member of the applicable notification association (as defined in C.R.S. § 9-1.5-102(4)) for the geographical area of the Project.

b. Developer shall register with the applicable notification association all new facilities that are the Developer's responsibility to install, locate, and protect throughout the Construction Period, including but not limited to fiber, electric and the Cover MEP System.

c. At Substantial Completion, the Developer shall register, and shall at all times during the Term remain registered, with the applicable notification association for all facilities that are the Developer's responsibility to locate and protect throughout the Operating Period, including electric systems and the Cover MEP System.

d. Prior to commencement of the O&M Work with respect to the ITS and ETC facilities, the Developer shall register, and at all times until such Work is completed shall remain registered, with the applicable notification association for all the facilities that are the Developer's responsibility to locate and protect pursuant to Schedule 11 (*Operations and Maintenance Requirements*).

4.2. Operation of the permitting procedure

4.2.1. The Department will ensure that, in the operation of its procedure for issuing Access Permits in relation to the Project, CDOT will act pursuant to this Section 4.

4.2.2. The Department will promptly notify Developer of any application for an Access Permit that it receives and provide a copy of the application and all supporting documentation and will consult with Developer in relation to the issue of the Access Permit.

4.2.3. The Department will impose a special condition on each Access Permit in substantially the following terms:

a. Permittee shall coordinate with Developer of the Project for work that encroaches on the highway managed lanes, and traffic control plans are to be reviewed and accepted by Developer before construction.

b. Permittee shall coordinate with the following Developer representative:

i. Name

ii. Address

iii. Phone

c. Any indemnification requirement contained in the permit's standard or other special provisions shall be amended to read as follows:

"To the extent authorized by law, Permittee hereby assumes, releases, and agrees to indemnify, defend, protect, and save the State of Colorado and Developer from and against any loss and/or damages to the property of the State of Colorado, Developer, third parties or the Permittee's facilities, and all loss and/or damage on account of injury to or death of any person whomsoever, arising at any time, caused by or growing out of the occupation of Colorado State Highway rights of way by Permittee's facilities or any part thereof, including but not limited to installation, adjustment, relocation, maintenance or operation, or removal of existing facilities, unless such loss and/or damage arises from the sole negligence of willful conduct of the State of Colorado, Developer or their employees or agents."

d. Permittee shall also name Developer as an additional insured on their Commercial General Liability, Auto Liability, Pollution Legal Liability and Umbrella or Excess Liability insurance policies in addition to naming the Department as an additional insured as required by Standard Term 3.H.

4.2.4. The Department shall use its Reasonable Efforts to address any reasonable requirements of Developer, including in relation to scheduling, in relation to any other special condition to be included in the Access Permit.

4.2.5. For certainty, it shall be the responsibility of Developer, and not the Department, to verify to its satisfaction that any Person exercising a right of access pursuant to an Access Permit has complied with its obligation to have insurance cover as required by the special condition referred to in Section 4.2.3 of this Schedule 18.

5. Miscellaneous

5.1. Prohibition Against Coercion, Impairment of Safety, and Inconvenience of Displaced Occupants Still in Occupancy

5.1.1. Developer acknowledges and agrees that, in compliance with 23 CFR § 710.313(d)(3), the Department may establish hold off zones around occupied properties whose occupants are being displaced by any ROW Parcel, Additional ROW Parcel or Temporary Easement acquisition, but have not vacated the premises. If such zones are established, no construction-related activity will be allowed within the hold off zone until the Department provides written authorization.

5.1.2. Developer agrees to comply with, and take all necessary steps to ensure that Department is able to comply with, 23 CFR § 710.313(d)(4)-(6) with respect to any ROW Parcel, Additional ROW Parcel or Temporary Easement being acquired pursuant to this Schedule 18.

6. Deliverables

At a minimum, Developer shall submit the following to the Department for Information, Acceptance, or Approval as indicated in accordance with the specified time frames.

Table 1 Deliverables

Deliverable	Information, Acceptance, or Approval	Schedule
Property Management Plan	Acceptance	60 Calendar Days after issuance of NTP1
Certification of review of CDOT Right of Way Manual	Information	Prior to the issuance of NTP1
Parcel acquisition files	Acceptance	No later than five Working Days prior to the tender of payment to land owner
Condemnation memorandum and check list form	Approval	Concurrent with the request to the Department for property condemnation
Written notification by Developer to commence partial acquisitions	Information / Acceptance (with respect to Safeway Parcel only)	Per Developer's Project Schedule
Written request by Developer, including required accompanying documents, to acquire ROW Parcels that require prior notice as indicated in Appendix A	Acceptance	No later than 18 months prior to the anticipated Substantial Completion Date (as determined by reference to the Project Schedule).
Written request by Developer to acquire Additional ROW Parcel, including required accompanying documents	Approval	As required
Project Tracking and Quality Control/Quality Assurance System	Acceptance	Prior to Developer's acquisition of any Additional Right-of-Way or Temporary Easements
All information required for the Transportation Commission to approve of ROW Plans and the acquisition of Additional ROW Parcels	Approval	At least 60 Calendar Days prior to the date at which approval by the Transportation Commission is being sought.
Submit written acquisition and relocation procedures	Acceptance	Concurrent with Developer request to acquire Additional ROW Parcels
Permission to Enter Property Form	Acceptance	At least five Working Days prior to entering private property
Structure Survey Assessment Report ("SSAR") (per parcel structure)	Acceptance	15 Working Days prior to demolition
Demolition Plan	Acceptance	15 Working Days prior to demolition
Appraisals	Acceptance	Prior to issuance of FMV by Department
Value Findings	Approval	Prior to offer being made
Relocation Plan	Approval	With request for Additional Right-of-Way
Final Settlement	Approval	Prior to execution of a binding memorandum of understanding and closing.
All information required for the Transportation Commission to approve commencing a condemnation action	Approval	At least 45 Calendar Days prior to the date at which approval by the Transportation Commission is being sought.

7. Appendices

Appendix A	Right-of-Way Schedule
Appendix B	Steps to be followed by Developer in the Right-of-Way Acquisition Process
Appendix C	Steps to be followed by Developer in the Relocation Process

Appendix A

Right-of-Way Schedule

Subject to delivery of a Developer notice pursuant to Section 3(a) of Part B of Schedule 28 (*Proposal Extracts*)), those parcels listed in Exhibit I of Part B of Schedule 28 (*Proposal Extracts*) shall be deemed added as ROW Parcels to the table below in accordance with Section 4 of Part B of Schedule 28 (*Proposal Extracts*).

Parcel # (In Fee Unless shown as Partial and/or TEs)	Design Section	DEPT = Department DEV = Developer ACQ = Acquisition PM = Property Mgmt.	Owner	Area of Partial Acquisition (Square Feet)	Date First Available for Possession
CCD Acquisition Parcel Right-of-Way Exhibits in Schedule 10B Contract Drawings	Brighton Boulevard to Quebec St.	DEPT – ACQ DEV – PM	CCD (previous)	N/A	NTP2
AP-5 and AP-5A	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ & PM	Ringsby Terminal Inc. (previous)	N/A	NTP2
AP-11	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ & PM	Gene Levy (previous)	N/A	NTP2
AP-17	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ & PM	Tedrow Investments LLC (previous)	N/A	NTP2
AP-18	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ & PM	Vibha Sharma (previous)	N/A	NTP2
AP-30	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ & PM	Earl Brown (previous)	N/A	NTP2
AP-31	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ & PM	Victoria & William Burke (previous)	N/A	NTP2
AP-41	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ & PM	Karl C De Baca (previous)	N/A	NTP2
AP-54	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ & PM	Drew Brennan Arnold (previous)	N/A	NTP2

Parcel # (In Fee Unless shown as Partial and/or TEs)	Design Section	DEPT = Department DEV = Developer ACQ = Acquisition PM = Property Mgmt.	Owner	Area of Partial Acquisition (Square Feet)	Date First Available for Possession
AP-57	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ & PM	Jose Guzman (previous)	N/A	NTP2
AP-58	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ & PM	Mark Escobedo (previous)	N/A	NTP2
AP-59	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ & PM	Adam Van Patten (previous)	N/A	NTP2
AP-76	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ & PM	Todd A. and Cherish Wells (previous)	N/A	NTP2
AP-88	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ & PM	Denver Rescue Mission (previous)	N/A	NTP2
AP-6	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ & PM	4623 High Street Trust (previous)	N/A	NTP2
AP-19	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ & PM	Hipolito Diaz-Luevano (previous)	N/A	NTP2
AP-20	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ & PM	Larry and Malinda Kowalis (previous)	N/A	NTP2
AP-22	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ & PM	First Securities Corp. (previous)	N/A	NTP2
AP-23	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV - PM	Ventura and Maria Reyes (previous)	N/A	NTP2
AP-27	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ & PM	Gene and Pamela Williamson (previous)	N/A	NTP2
AP-32	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ & PM	Saul Miguel and Victoria Villarreal (previous)	N/A	NTP2

Parcel # (In Fee Unless shown as Partial and/or TEs)	Design Section	DEPT = Department DEV = Developer ACQ = Acquisition PM = Property Mgmt.	Owner	Area of Partial Acquisition (Square Feet)	Date First Available for Possession
AP-42	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV - PM	Kenneth and Linda Mervin	N/A	NTP2
AP-46	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ & PM	Germain Investment Company (previous)	N/A	NTP2
AP-50	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ & PM	Victor Gutierrez (previous)	N/A	NTP2
AP-55	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ & PM	Jacinto and Ivan Luiz Acevedo (previous)	N/A	NTP2
AP-60	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ & PM	Traci J O'Brien (previous)	N/A	NTP2
AP-63 (Partial)	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	Denver Public School District No. 1 (Swansea School)	46,389	7/31/18
AP-66	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	JJH Inc. (Colonial Manor Motel)	N/A	6/28/18
AP-66A & AP-66B	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	JJH Inc. (Vacant Lots @ Colonial Motel)	N/A	6/28/18
AP-86 & AP-86A	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ / Limited PM[1] DEV – PM	Pilot Travel Centers LLC	N/A	NTP2
P-86B	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	Blue Beacon U.S.A., L.P.II, a Colo. LLC	N/A	NTP2
AP-91	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV - PM	Miles Lane Ltd. (previous)	N/A	NTP2

[1] The Department will empty the underground storage tanks. The Developer is responsible for all other Property Management activities, including removal of said storage tanks.

Parcel # (In Fee Unless shown as Partial and/or TEs)	Design Section	DEPT = Department DEV = Developer ACQ = Acquisition PM = Property Mgmt.	Owner	Area of Partial Acquisition (Square Feet)	Date First Available for Possession
AP-93 & AP-93A	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ / Limited PM[2] DEV – PM	Stanley J. Anderson Trust (previous)	N/A	1/31/20
AP-94	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ & PM	Sno-White Linen & Uniform Rental, Inc. (previous)	N/A	NTP2
AP-96	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ & PM	Penske Truck Leasing Co., L.P. (previous)	N/A	NTP2
AP-101	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ & PM	Robert Macias (La Mex Bar and Grill) (previous)	N/A	NTP2
AP-180 & AP-180A	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ & PM	Harold Deter (previous)	N/A	NTP2
AP-9	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ & PM	Adamsclock LLC (previous)	N/A	NTP2
AP-15	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ & PM	Flamingo Vista LLC (previous)	N/A	NTP2
AP-21	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ & PM	Dadourian West LLC (previous)	N/A	NTP2
AP-29	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ & PM	Eric Ely (previous)	N/A	NTP2
AP-169 and AP-TE-169A (for RR work)	Brighton Boulevard To Colorado Boulevard	DEPT – ACQ; DEV – PM	N.K. Sharma	N/A – AP-169; 63 – AP-TE-169	NTP2
AP-43	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEPT – PM	Bruce and Wayne Medina (previous)	N/A	NTP2

[2] The Department will remove the small structure and underground diesel tank. The Developer is responsible for all other Property Management activities.

Parcel # (In Fee Unless shown as Partial and/or TEs)	Design Section	DEPT = Department DEV = Developer ACQ = Acquisition PM = Property Mgmt.	Owner	Area of Partial Acquisition (Square Feet)	Date First Available for Possession
AP-44	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEPT – PM	John Slavinski (previous)	N/A	NTP2
AP-45	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEPT – PM	Michael Fritts (previous)	N/A	NTP2
AP-47	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEPT – PM	Richard Kevin Schneider Trust (previous)	N/A	NTP2
AP-48	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEPT – PM	Michael Fritts (previous)	N/A	NTP2
AP-52	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEPT – PM	Alternative Auto Solutions, LLC (previous)	N/A	NTP2
AP-67	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEPT – PM	Justin McLead (previous)	N/A	NTP2
AP-PE-92 (Partial)	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEPT – PM	BCP-45th Ave. I, LLC (obtained)	5,252	NTP2
AP-28	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ; DEV – PM	Estolfo Rodelas and Octavio Rodelas-Medina	N/A	NTP2
AP-72	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ; DEV – PM	Aurelio Ruiz and Sergio Ruiz-Renteria (previous)	N/A	NTP2
AP-78	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	Diane Fleck (previous)	N/A	NTP2
AP-102	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ; DEV – PM	Big B LLC	N/A	NTP2
AP-109	Colorado Boulevard to Quebec St. Boulevard	DEPT – ACQ; DEV – PM	First Union Group and SD-WH Ltd. LLP	N/A	NTP2

Parcel # (In Fee Unless shown as Partial and/or TEs)	Design Section	DEPT = Department DEV = Developer ACQ = Acquisition PM = Property Mgmt.	Owner	Area of Partial Acquisition (Square Feet)	Date First Available for Possession
AP-122	Colorado Boulevard to Quebec St.	DEPT – ACQ DEV – PM	5601, LLC	N/A	NTP2
AP-184	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ; DEV – PM	Anthony Sanchez (previous)	N/A	NTP2
AP-185	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	Albert and Agnes Garcia (previous)	N/A	NTP2
AP-PE-25 (partial) and AP-TE-25	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ; DEV – PM	Nestle Purina Petcare Company	1,214 – AP-PE-25; 1,761 – AP-TE-25	2/28/18
PE-26 (Partial)	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	UPRR	53,966	After UPRR construction per the UPRR RRA
AP - Construction License (formerly TE-26)	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	UPRR	759,055	2/28/18
AP - Construction License (formerly TE-26A)	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV - PM	UPRR	Included with Construction License Above	2/28/18
PE-26B	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	UPRR	15,340	After UPRR construction per the UPRR RRA
PE-26I (Partial)	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	UPRR	809	After UPRR construction per the UPRR RRA
AP-TE-212	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	Thomas M. Secrist	3,535	2/28/18
AP-TE-213	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	Focus Points Family Resource Center	20,593	2/28/18

Parcel # (In Fee Unless shown as Partial and/or TEs)	Design Section	DEPT = Department DEV = Developer ACQ = Acquisition PM = Property Mgmt.	Owner	Area of Partial Acquisition (Square Feet)	Date First Available for Possession
AP-182	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	The Western Stock Show Association	N/A	2/28/18
AP-182A	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	The Western Stock Show Association	N/A	2/28/18
AP-TE-170	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	Paul and Maria Cristina Arrieta (obtained)	456	NTP 2
AP-89 (Partial) & AP-TE-89	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	Manna Pro West, LLC	501 – AP-89; 27,263 – AP-TE-89	2/28/18
AP-TE-192	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	Weakland Investments LLC	7,584	2/28/18
AP-PE-90 (Partial)	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	BNSF	718	2/28/18
AP-TE-90	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	BNSF	93,145	2/28/18
AP-PE-90A (Partial)	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	BNSF	15,678	2/28/18
AP-TE-90A	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	BNSF	28,003	2/28/18
AP-136 (Partial)	Colorado Boulevard to Quebec Street	DEPT – ACQ DEV – PM	DRIRR	1,574	2/28/18
AP-PE-136A (Partial)	Colorado Boulevard to Quebec Street	DEPT – ACQ DEV – PM	DRIRR	1,894	2/28/18
AP-136B (Partial)	Colorado Boulevard to Quebec Street	DEPT – ACQ DEV – PM	DRIRR	12,626	2/28/18

Parcel # (In Fee Unless shown as Partial and/or TEs)	Design Section	DEPT = Department DEV = Developer ACQ = Acquisition PM = Property Mgmt.	Owner	Area of Partial Acquisition (Square Feet)	Date First Available for Possession
AP-8	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	Jack E. Ruddy	N/A	8/31/18
AP-14	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	Albert J. Garcia	N/A	8/31/18
AP-33	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	Cameron Gray (previous)	N/A	8/31/18
AP-34	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	Anthony Toth (previous)	N/A	8/31/18
AP-49	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	Vincent and Judy Sanchez	N/A	8/31/18
AP-49A	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	Vincent and Judy Sanchez	N/A	8/31/18
AP-53	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	Jeff Portales (previous)	N/A	8/31/18
AP-68	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	Irene Luchetta and Dorothy Ann Magana	N/A	8/31/18
AP-69	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	Charles Dady, Jr.	N/A	8/31/18
AP-70	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	Oscar Ortiz and Leonila Rivera Carrera	N/A	8/31/18
AP-73	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	Esiquia Rochas Casillas	N/A	8/31/18
AP-74	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	Mauro Ramirez	N/A	8/31/18

Parcel # (In Fee Unless shown as Partial and/or TEs)	Design Section	DEPT = Department DEV = Developer ACQ = Acquisition PM = Property Mgmt.	Owner	Area of Partial Acquisition (Square Feet)	Date First Available for Possession
AP-75	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	Hosetta Washington (previous)	N/A	8/31/18
AP-77	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	Lavonne Emiko Griffie (previous)	N/A	8/31/18
AP-79	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	46 Fillmore LLC (previous)	N/A	8/31/18
AP-80	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	Mary Fletcher	N/A	8/31/18
AP-81	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	Mary Santa Cruz Trust	N/A	8/31/18
AP-83	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	Mayra Manuela and Juan Carlos Lodoza	N/A	8/31/18
RW-1L (Partial)	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	City and County of Denver	2,490	14 months after Written Notice from Developer to Department for Acquisition
RW-2 (Partial)	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	Alberto Rocha	830	14 months after Written Notice from Developer to Department for Acquisition
RW-82 (Partial)	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	Randall T. Lopez	350	14 months after Written Notice from Developer to Department for Acquisition

Parcel # (In Fee Unless shown as Partial and/or TEs)	Design Section	DEPT = Department DEV = Developer ACQ = Acquisition PM = Property Mgmt.	Owner	Area of Partial Acquisition (Square Feet)	Date First Available for Possession
RW-84 (Partial)	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV-PM	Crystal F. Silerio Castanon and Manuel Barrios	90	14 months after Written Notice from Developer to Department for Acquisition
RW-85 (Partial)	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	4500 Steele Street LLC	350	14 months after Written Notice from Developer to Department for Acquisition
RW-87 (Partial)	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	Perschbacher Investments LLC	9,190	14 months after Written Notice from Developer to Department for Acquisition
RW-103 (Partial)	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	4600 Stapleton Drive Co., LLC	41,820	14 months after Written Notice from Developer to Department for Acquisition
RW-104 (Partial)	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	Wright & McGill CO.	1,240	14 months after Written Notice from Developer to Department for Acquisition
RW-105 (Partial)	Colorado Boulevard to Quebec St.	DEPT – ACQ DEV – PM	Safeway Stores 47, Inc.	1,460	14 months after Written Notice from Developer to Department for Acquisition

Parcel # (In Fee Unless shown as Partial and/or TEs)	Design Section	DEPT = Department DEV = Developer ACQ = Acquisition PM = Property Mgmt.	Owner	Area of Partial Acquisition (Square Feet)	Date First Available for Possession
RW-106 (Partial)	Colorado Boulevard to Quebec Street	DEPT – ACQ DEV – PM	McMillan Sales Corp.	7,450	14 months after Written Notice from Developer to Department for Acquisition
RW-111 (Partial)	Colorado Boulevard to Quebec Street	DEPT – ACQ DEV – PM	I-70 Glencoe Forest RLLP, a Colo. LLP	175	14 months after Written Notice from Developer to Department for Acquisition
RW-112 (Partial)	Colorado Boulevard to Quebec Street	DEPT – ACQ DEV – PM	Glencoe LLC, a Colo. LLP	8,670	14 months after Written Notice from Developer to Department for Acquisition
RW-114 (Partial)	Colorado Boulevard to Quebec Street	DEPT – ACQ DEV – PM	Armas Properties, LLC	3,080	14 months after Written Notice from Developer to Department for Acquisition
RW-115 (Partial)	Colorado Boulevard to Quebec Street	DEPT – ACQ DEV – PM	PDX 4425 Grape (CO), LLC	190	14 months after Written Notice from Developer to Department for Acquisition
RW-116 (Partial)	Colorado Boulevard to Quebec Street	DEPT – ACQ DEV – PM	Sara S. Scott Trust	100	14 months after Written Notice from Developer to Department for Acquisition

Parcel # (In Fee Unless shown as Partial and/or TEs)	Design Section	DEPT = Department DEV = Developer ACQ = Acquisition PM = Property Mgmt.	Owner	Area of Partial Acquisition (Square Feet)	Date First Available for Possession
RW-117 (Partial)	Colorado Boulevard to Quebec Street	DEPT – ACQ DEV – PM	Speidell Real Estate Group, LLC	130	14 months after Written Notice from Developer to Department for Acquisition
RW-118 (Partial)	Colorado Boulevard to Quebec Street	DEPT – ACQ DEV – PM	Diner Group, LLP	2,060	14 months after Written Notice from Developer to Department for Acquisition
RW-119 (Partial)	Colorado Boulevard to Quebec Street	DEPT – ACQ DEV – PM	John Priola Jr. Warehouse LLC	2,590	14 months after Written Notice from Developer to Department for Acquisition
RW-121 (Partial)	Colorado Boulevard to Quebec Street	DEPT – ACQ DEV – PM	Van Waters & Rogers Inc.	550	14 months after Written Notice from Developer to Department for Acquisition
RW-123 (Partial)	Colorado Boulevard to Quebec Street	DEPT – ACQ DEV – PM	University Park Real Estate LLC	2,020	14 months after Written Notice from Developer to Department for Acquisition
RW-125 (Partial)	Colorado Boulevard to Quebec St.	DEPT – ACQ DEV – PM	4355 Kearney Street LLC	8,740	14 months after Written Notice from Developer to Department for Acquisition

Parcel # (In Fee Unless shown as Partial and/or TEs)	Design Section	DEPT = Department DEV = Developer ACQ = Acquisition PM = Property Mgmt.	Owner	Area of Partial Acquisition (Square Feet)	Date First Available for Possession
RW-126 (Partial)	Colorado Boulevard to Quebec St.	DEPT – ACQ DEV – PM	FR CO/TEX CUNA LLC	540	14 months after Written Notice from Developer to Department for Acquisition
RW-127 (Partial)	Colorado Boulevard to Quebec Street	DEPT – ACQ DEV – PM	John Deere Plow Company	10,750	14 months after Written Notice from Developer to Department for Acquisition
RW-130 (Partial)	Colorado Boulevard to Quebec Street	DEPT – ACQ DEV – PM	462 Thomas Family Properties LP	8,920	14 months after Written Notice from Developer to Department for Acquisition
RW-130A (Partial)	Colorado Boulevard to Quebec Street	DEPT – ACQ DEV – PM	462 Thomas Family Properties LP	3,010	14 months after Written Notice from Developer to Department for Acquisition
RW-132 (Partial)	Colorado Boulevard to Quebec Street	DEPT – ACQ DEV – PM	4940 Jackson, LLC	4,190	14 months after Written Notice from Developer to Department for Acquisition
RW-133 (Partial)	Colorado Boulevard To Quebec St.	DEPT – ACQ DEV- PM	6750 E. Stapleton LLC	3,790	14 months after Written Notice from Developer to Department for Acquisition

Parcel # (In Fee Unless shown as Partial and/or TEs)	Design Section	DEPT = Department DEV = Developer ACQ = Acquisition PM = Property Mgmt.	Owner	Area of Partial Acquisition (Square Feet)	Date First Available for Possession
RW-134 (Partial)	Colorado Boulevard to Quebec Street	DEPT – ACQ DEV – PM	Micheal & Dianna Keffer	1,560	14 months After Written Notice from Developer to Department for Acquisition
RW-135 (Partial)	Colorado Boulevard to Quebec Street	DEPT – ACQ DEV – PM	Allen & Mary Ann Chappell	510	14 months After Written Notice from Developer to Department for Acquisition
RW-137 (Partial)	Colorado Boulevard to Quebec Street	DEPT – ACQ DEV – PM	Condor Snack Foods, Inc.	7,100	14 months After Written Notice from Developer to Department for Acquisition
RW-138 (Partial)	Colorado Boulevard to Quebec Street	DEPT – ACQ DEV – PM	Upland Industries Corporation	1,050	14 months After Written Notice from Developer to Department for Acquisition
RW-183 (Partial)	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	The Western Stock Show Association	540	14 months After Written Notice from Developer to Department for Acquisition
RW-211 (Partial)	Brighton Boulevard to Colorado Boulevard	DEPT – ACQ DEV – PM	SEJ Asset Management & Investment Company	100	14 months After Written Notice from Developer to Department for Acquisition

Parcel # (In Fee Unless shown as Partial and/or TEs)	Design Section	DEPT = Department DEV = Developer ACQ = Acquisition PM = Property Mgmt.	Owner	Area of Partial Acquisition (Square Feet)	Date First Available for Possession
RW-196 (Partial)	Colorado Boulevard to Quebec St.	DEPT – ACQ DEV – PM	A & R Investment LLC	590	14 months after Written Notice from Developer to Department for Acquisition
RW-198 (Partial)	Colorado Boulevard to Quebec St.	DEPT – ACQ DEV – PM	St. Paul Properties, Inc.	180	14 months after Written Notice from Developer to Department for Acquisition
RW-206 (Partial)	Colorado Boulevard to Quebec St.	DEPT – ACQ DEV – PM	6666 Stapleton Drive LLC	1,860	14 months After Written Notice from Developer to Department for Acquisition
RW-207 (Partial)	Colorado Boulevard to Quebec St.	DEPT – ACQ DEV - PM	Knudsen Denver, LLC	390	14 months After Written Notice from Developer to Department for Acquisition

Appendix B
Steps to be followed by Developer in the Acquisition Process for Additional Right-of-Way and Temporary Easements

Note that all time frames in this table are approximations and not binding obligations upon, or assurances from, the Department.

Description of ROW Task	Entity Responsible for Completion of ROW Task	Approximate Time Frame for Completion of ROW Task	Entity Responsible for Acceptance or Approval of ROW Task	Approximate Time Frame for Acceptance or Approval of ROW Task	Comments
Survey	Developer	Variable depending on scope, 2-4 weeks for smaller surveys, 2-4 months for larger surveys	Department's Survey Unit	2-3 weeks from submission	This is only survey of property boundary and topography needed for development of Right of Way Plans.
Delivery of engineering design of improvements requiring ROW completed to a sufficient level to ensure that location, size and shape of ROW parcels will not change as design is advanced	Developer	Variable depending on scope of improvements to be designed	Developer's design review team and Department's ROW Manager	Variable depending on scope of improvements designed	Completion of sufficient design to this level is a common cause of delay in the Right of Way Plans development process
ROW Plans	Developer	60 to 120 Calendar Days for ROW plan preparation depending upon the number of acquisitions, and complexity of the plans and title matters	Transportation Commission approves ROW plans	Approx. 45 to 60 Calendar Days for Transportation Commission approval of ROW plans	ROW plan preparation is a time consuming process for both preparation and procurement of Transportation Commission approval.

Description of ROW Task	Entity Responsible for Completion of ROW Task	Approximate Time Frame for Completion of ROW Task	Entity Responsible for Acceptance or Approval of ROW Task	Approximate Time Frame for Acceptance or Approval of ROW Task	Comments
Appraisal and Appraisal review	Appraisal: Developer Appraisal review: Department	6-12 weeks per appraisal per landowner 2-4 weeks to review an appraisal	Department	2-4 weeks to review an appraisal	If the estimated value of the acquisition is or less, a waiver valuation can be prepared by a real estate specialist and an appraisal review of the value estimate is not needed. All requests for valuation by a waiver valuation vs. an appraisal must be Approved by Department.
Acquisition negotiation	Developer	Approx. 45-60 Calendar Days to obtain approval of the Transportation Commission from the date of Developer's request and provision of required documentation. 4-6 weeks for the initial negotiation. 2 weeks for a final offer letter. 2 weeks for a last and final offer letter, if given.	Transportation Commission approves initiation of negotiations. If the settlement amount is more than the FMV, the Department's Approval is required as set forth in the CDOT Right of Way Manual.	2-4 Calendar Days to review and Approve backup documentation of completed acquisition negotiations Approx. 30 Calendar Days is required to obtain the Department's approval of the final settlement amount.	Developer cannot use duress or coercion in acquisition negotiations

Description of ROW Task	Entity Responsible for Completion of ROW Task	Approximate Time Frame for Completion of ROW Task	Entity Responsible for Acceptance or Approval of ROW Task	Approximate Time Frame for Acceptance or Approval of ROW Task	Comments
Condemnation	Colorado Attorney General's Office	Developer must obtain advance approval of the Transportation Commission before a condemnation action can be commenced. After obtaining Transportation Commission approval, at least four months is required to file a condemnation petition, serve it on the parties, set and hold an immediate possession hearing. Valuation trials can take a year or more from the date of filing the condemnation petition.	Approval of the Transportation Commission is required before a condemnation can commence.	Approximately 45-60 Calendar Days to receive approval of the Transportation Commission to condemn.	All offers to purchase must be made in the Department's name, so the Attorney General's Office is properly authorized to represent the Department as the condemning authority in the condemnation proceeding.
Certification that acquisition was completed in compliance with state and federal requirements	Developer	At Developer's discretion, but only after Department's acceptance of Developer's acquisition files.	Department's ROW Manager	At least 5 Working Days after Department's ROW Manager's receipt of the Developer's Certification Letter in acceptable form and the ROW Manager's acceptance of acquisition files provided to the Department by the Developer	For purposes of efficiency, it is preferred that the Developer receive the Department's acceptance of its acquisition files prior to the Developer's submittal of its Certification letter to the Department.

Appendix C

Steps to be followed by Developer in the Relocation Process for Additional Right-of-Way

Note that all time frames in this table are approximations and not binding obligations upon, or assurances from, the Department.

Description of ROW Task	Entity Responsible for Completion of ROW Task	Approximate Time Frame for Completion of ROW Task	Entity Responsible for Acceptance or Approval of ROW Task	Approximate Time Frame for Completion of Acceptance or Approval of ROW Task	Comments
Relocation Planning Studies Required by 49 CFR § 24.205	Developer	Variable depending on scope; 1-2 weeks for smaller studies; 60-90 Calendar Days for larger studies	Department's Headquarter ROW Unit	1-3 weeks from submission, depending on size of the study	
Relocation Advisory Services Required by 49 CFR § 24.205	Developer	Variable. Typically continuous throughout relocation process.	Department's Acquisition / Relocation Supervisor. Note: Approval of a specific Deliverable is not required. Rather this is general oversight by the Department.	Generally continuous throughout relocation process.	Department's Acquisition / Relocation personnel can assist with advisory services, as needed.
Provide displaced occupants with notice that they have 90 Calendar Days to vacate the premises and, additionally, later notice that they have 30 Calendar Days to vacate the premises 49 CFR § 24.203	Developer	The 90 Day notice is provided at the time the written offer to purchase the property is provided to the landowner	Department's Acquisition / Relocation Supervisor. Note: Approval of a specific Deliverable is not required. Rather this is general oversight by the Department.		90 Calendar Days for a displaced occupant to find a replacement property and move into it is the minimum required by law. As a practical matter, that is too short, especially for displaced businesses. It is desirable to lengthen this minimum time frame as much as possible. At least 6 months

Description of ROW Task	Entity Responsible for Completion of ROW Task	Approximate Time Frame for Completion of ROW Task	Entity Responsible for Acceptance or Approval of ROW Task	Approximate Time Frame for Completion of Acceptance or Approval of ROW Task	Comments
					is a better expectation. The 30 Calendar Day notice cannot be provided until possession of the underlying property is obtained.
Business Relocation Prepare and submit requests for reimbursement of all available business relocation monetary benefits, including expenses incurred searching for a replacement property, 49 CFR § 24.301, moving expenses, 49 CFR § 24.301, reestablishment 49 CFR § 24.304, or single "in lieu" payment, 49 CFR § 24.305	Developer	Variable	Department's Headquarter ROW Unit	2-5 Calendar Days per submittal	Since these are reimbursable expenses, the displaced occupant must actually incur the expenses before a request for reimbursement can be prepared.

Description of ROW Task	Entity Responsible for Completion of ROW Task	Approximate Time Frame for Completion of ROW Task	Entity Responsible for Acceptance or Approval of ROW Task	Approximate Time Frame for Completion of Acceptance or Approval of ROW Task	Comments
Residential Relocation Prepare and submit requests for reimbursement of all available residential relocation monetary benefits, including replacement housing payment, 49 CFR § 24.401 and moving expenses, 49 CFR § 24.301	Developer	Variable	Department's Headquarter ROW Unit	5-10 Calendar Days per submittal	Since these are reimbursable expenses, the displaced occupant must actually incur the expenses before a request for reimbursement can be prepared.
Certification that relocation was completed in compliance with State and Federal requirements	Developer	At Developer's discretion, but only after all relocation has been completed.	Department's ROW Manager	At least 5 Working Days after receipt by Department's ROW Manager.	

Schedule 19
Forms of Direct Agreements

Part A: Form of Lenders Direct Agreement

This Direct Agreement (this "Agreement") is dated as of [ ] and made among:

(1) Colorado High Performance Transportation Enterprise ("HPTE"), a government-owned business within, and a division of, the Colorado Department of Transportation ("CDOT");

(2) Colorado Bridge Enterprise, a government-owned business within CDOT ("BE" and, together with HPTE, each individually an "Enterprise" and, together, the "Enterprises");

(3) Kiewit Meridiam Partners LLC, a limited liability company formed under the laws of the State of Delaware ("Developer"); and

(4) [ ] as collateral agent (the "Collateral Agent") for the benefit of the Lenders (as defined below).

RECITALS

Whereas:

(A) The Enterprises and Developer have entered into a Project Agreement for the Central 70 Project dated as of November 21, 2017 (as the same may be amended, modified or supplemented from time to time in accordance with its terms, the "Project Agreement"), in connection with the design, construction, financing, operation and maintenance of a portion of the I-70 East corridor in Greater Denver (the "Project") as more fully described in the Project Agreement.

(B) Pursuant to the Financing Documents listed in Annex A, the Collateral Agent is the agent for the various providers of Project Debt to Developer (collectively, the "Lenders"), the proceeds of which will be used by Developer to finance the Project.

(C) It is a condition precedent to both Financial Close under Schedule 1 (*Financial Close*) to the Project Agreement and to closing and funding of the Project Debt under the Financing Documents that the parties hereto execute this Agreement.

Now, therefore, in consideration of their mutual undertakings and agreements hereunder, and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties undertake and agree as follows:

1. DEFINITIONS, INTERPRETATION AND RELATIONSHIP TO PROJECT AGREEMENT

1.1 Definitions

(a) Capitalized terms used but not defined in this Agreement shall have the meanings given to them in Part A of Annex A (*Definitions and Abbreviations*) of the Project Agreement. For certainty, uncapitalized terms used but not defined in this Agreement shall, subject to Section 1.2, be construed in accordance with their plain meaning and shall not have the meanings (if any) given to them in Part A of Annex A (*Definitions and Abbreviations*) of the Project Agreement.

(b) Except as otherwise specified herein, or as the context may otherwise require, the following terms have the respective meanings set out below for all purposes of this Agreement:

"Collateral Agent"	has the meaning given to it in the Preamble.
"Collateral Agent Notice"	has the meaning given to it in Section 3.2(a).

"Cure Period" means, with respect to any Developer Default, the period commencing on the Enterprise Notice Date and ending on the earliest of:

(a) the relevant Cure Period Completion Date;

(b) any subsequent Step-out Date;

(c) any subsequent Substitution Effective Date; and

(d) the Expiry Date or the Termination Date, as applicable.

"Cure Period Completion Date" means, with respect to any Developer Default, the date which is:

(a) in the case of each of the Developer Defaults numbered (9) and (20) in Section 32.1.1 of the Project Agreement, 60 Calendar Days after the relevant Cure Period Measurement Date;

(b) in the case of each of the Developer Defaults numbered (1), (2), (3) and (26) in Section 32.1.1 of the Project Agreement, 120 Calendar Days after the relevant Cure Period Measurement Date; and

(c) in the case of any other Developer Default, 90 Calendar Days after the relevant Cure Period Measurement Date, subject to extension for up to (I) an additional 180 Calendar Days, in the case of the Developer Default numbered (5) in Section 32.1.1 of the Project Agreement, or (II) an additional 90 Calendar Days, in the case of all other such Developer Defaults, in the case of each of (I) and (II) to the extent, and only to the extent, that:

(i) within such initial 90 Calendar Day period, the Collateral Agent and the Enterprises agree (each acting reasonably) to a plan specifying the remedial action to be taken in respect of the relevant Developer Default during such extended period; and

(ii) the period of extension requested by the Collateral Agent represents, in the reasonable opinion of the Enterprises, the period of time necessary to cure the relevant Developer Default in accordance with such plan,

provided that, notwithstanding the foregoing, if:

(d) the Collateral Agent is prohibited by any Governmental Authority or court order, or by any bankruptcy or insolvency proceedings or other similar proceedings, from curing the relevant Developer Default; or

(e) the Collateral Agent has commenced and is continuing to pursue all reasonably necessary processes and steps to obtain possession, custody and control of the Project and/or Developer, but despite such efforts the Collateral Agent is unable to obtain such possession, custody and control,

then the Cure Period Completion Date applicable to the relevant

Developer Default (including, for certainty, as extended in accordance with paragraph (c) of this definition) shall be extended by a period of time equal to:

(f) in the case of paragraph (d), the period of such prohibition, provided that, if the relevant bankruptcy or insolvency proceedings or other similar proceedings were commenced by the Collateral Agent acting on behalf of the Lenders, such period shall instead be the shorter of the period of:

(i) such prohibition; and

(ii) 270 Calendar Days; and

(g) in the case of paragraph (e), the shorter of the period of:

(i) such inability; and

(ii) 180 Calendar Days.

"Cure Period Measurement Date"	means, with respect to any Developer Default, the later of: (a) the Enterprise Notice Date; and (b) the date of expiration of the relevant Developer Default Cure Period pursuant to Sections 32.1.1 and 32.1.2 of the Project Agreement.
"Default"	any event or circumstance that would (with the expiration of a grace period, the giving of notice, the lapse of time, the making of any determination or any combination of any of the foregoing) result in an Event of Default.
"Designated Account"	means [ ].[1]
"Developer"	has the meaning given to it in the Preamble.
"Enterprises"	has the meaning given to it in the Preamble.
"Enterprise Notice"	has the meaning given to it in Section 3.1(a).
"Enterprise Notice Date"	means the date on which the Collateral Agent receives the Enterprise Notice with respect to a Developer Default as determined pursuant to Section 15.5(b).
"Event of Default"	means any "Event of Default" as defined in the Financing Documents.[2]
"Lenders"	has the meaning given to it in the Recitals.
"Lenders' Subcontract Direct Agreements"	means the documents listed in paragraphs [_] and [_] of Annex A to this Agreement.
"Private Sector Parties"	means Developer and the Collateral Agent.
"Project Agreement"	has the meaning given to it in the Recitals.

[1] See Section 2.3 below. Revise to reflect Developer's financing plan and Lenders' secured account requirements.
[2] Modify as needed to conform to the Financing Documents.

"Step-in Date"	has the meaning given to it in Section 5.3.
"Step-in Entity"	has the meaning given to it in Section 5.1.
"Step-in Entity Accession Agreement"	means any agreement entered into by a Step-in Entity pursuant to Section 5.3.
"Step-in Notice"	has the meaning given to it in Section 5.1(a).
"Step-in Period"	means any period from and including the relevant Step-in Date until the earliest of: (a) the Cure Period Completion Date with respect to the relevant Developer Default; (b) any subsequent Substitution Effective Date; (c) the relevant Step-out Date; and (d) the Expiry Date or the Termination Date, as applicable.
"Step-out Date"	means the date upon which any Step-out Notice is served by a Step-in Entity pursuant to Section 5.5(a).
"Step-out Notice"	has the meaning given to it in Section 5.5(a).
"Subordination Date"	has the meaning given to it in Section 12.2(b).
"Substitute"	has the meaning given to it in Section 6.1.
"Substitute Accession Agreement"	means any agreement entered into by a Substitute pursuant to Section 7.1.
"Substitution Effective Date"	has the meaning given to it in Section 7.1.
"Substitution Notice"	has the meaning given to it in Section 6.1(a).

1.2 Interpretation

(a) Headings and other internal references

(i) Headings are inserted for convenience only and shall not affect interpretation of this Agreement.

(ii) Except as the context may otherwise provide, the words "herein", "hereof" and "hereunder", and words of similar import, shall be construed to refer to this Agreement in its entirety and not to any particular provision of it.

(iii) Except as otherwise expressly provided or as the context may otherwise provide, a reference to any Section or Annex within this Agreement is a reference to such Section of, or Annex to, this Agreement.

(b) Common terms and references

(i) The singular includes the plural and vice versa.

(ii) Words preceding "include", "includes", "including" and "included" shall be construed without limitation by the words that follow.

(iii) The word "promptly" means as soon as reasonably practicable in light of then-prevailing circumstances.

(c) References to agreements, documents and Persons

Except as otherwise expressly provided in this Agreement, a reference:

(i) to an agreement or other document shall be construed to be a reference to such agreement or other document (including any schedules, annexes or exhibits thereto) as it may be amended, modified or supplemented from time to time in accordance with its terms and the terms of the Project Agreement and of the Financing Documents, as applicable; and

(ii) to a Person includes such Person's successors and permitted assigns and transferees.

(d) Deadlines occurring on Calendar Days

Whenever this Agreement requires any party hereto to make any payment, or provide or deliver any Acceptance, Approval, consent, approval or like assent, notice, comment or any information or material, or otherwise complete any action or performance, in each case on or no later than a date that is a Calendar Day that is not also a Working Day, then such deadline shall automatically be extended to the next Working Day to occur after such Calendar Day.

1.3 Relationship to Project Agreement

(a) In the event of any conflict, ambiguity or inconsistency between the provisions of the Project Agreement and the provisions of this Agreement, the provisions of this Agreement shall prevail.

(b) Notwithstanding the foregoing Section 1.3(a), nothing in this Agreement amends or modifies any of Developer's obligations under the Project Agreement.

2. CONSENT TO SECURITY; ETC.

2.1 Enterprises' Acknowledgement of and Consent to Security

(a) The Enterprises acknowledge notice and receipt of, and consent to:[3]

(i) the collateral assignment by Developer to the Collateral Agent of any or all of Developer's rights, title and interests in, to or under or derived from, the Project Agreement (including any such rights, title and interests in, to or derived from payments made by the Enterprises to Developer thereunder), the Subcontracts, the Contractor Bonds (to the extent Developer is an obligee (or beneficiary) thereunder), the Insurance Policies, the Supplemental Indenture and the Central 70 Note, in each case excluding, for certainty, any rights or interests to or in the Handback Reserve Account or the Physical Damage Proceeds Reserve; and

(ii) the grant by each of the Equity Members to the Collateral Agent of a security interest in its respective equity interest in Developer,

in each case pursuant to the Financing Documents.

(b) The Enterprises acknowledge and agree that none of the security interests referred to in Section 2.1(a) nor the foreclosure or enforcement of any thereof:

(i) constitutes (or with the giving of notice or lapse of time, or both, could constitute) either a breach of the Project Agreement or a Developer Default; or

(ii) requires any consent of the Enterprises that is either additional or supplemental to that granted pursuant to this Section 2.1.

[3] If reasonably required by Lenders, the Enterprises will agree to modify this provision prior to execution of this Agreement to provide for an acknowledgment that reflects the scope of the actual security package granted to the Lenders, provided that such grant complies with Section 27.3 of the Project Agreement.

(c) For so long as any amount of Project Debt is outstanding, the Enterprises shall not, without the prior written consent of the Collateral Agent, consent to any assignment, transfer, pledge or hypothecation of the Project Agreement or any interest therein by Developer, other than as specified in this Agreement.

2.2 Payments to Designated Account

(a) Unless directed otherwise by the Collateral Agent, the Enterprises shall pay all amounts payable by them to Developer under the Project Agreement into the Designated Account.

(b) Developer and the Collateral Agent both agree that any payment made by the Enterprises in accordance with Section 2.2(a) shall constitute a complete discharge of the Enterprises' relevant payment obligations under the Project Agreement, in the case of any partial payment to the extent of such payment.

2.3 Limitations on Collateral Agent's Rights and Interests

(a) The Collateral Agent acknowledges and agrees that neither it nor the Lenders shall, by virtue of the security interests referred to in Section 2.1(a), acquire any greater rights to or under the Project Agreement, the Subcontracts, the Contractor Bonds (to the extent Developer is an obligee (or beneficiary) thereunder), Insurance Policies, the Supplemental Indenture and the Central 70 Note than Developer itself has at any particular time therein.

(b) In the event that there are amounts (as determined pursuant to Section 17.5.1 or Section 17.5.2 of the Project Agreement, subject always to Section 17.5.3 of the Project Agreement) then past due and owing to any of the Developer's or Principal Subcontractor's, as the case may be, direct or indirect Subcontractors and laborers on account of any unpaid charges, liens, supplies, claims or invoices for work performed or materials supplied by such Subcontractors and laborers to the Project, then:

(i) the Enterprises; or

(ii) the Collateral Agent:

(A) during a Cure Period or a Step-in Period, following five Working Days' prior notice to the Enterprises; and

(B) otherwise, with the prior written consent of Enterprises (such consent not to be unreasonably withheld, conditioned or delayed),

shall each be entitled to call upon any Contractor Bond to satisfy any such payment obligations; provided that, during a Cure Period or a Step-in Period, the Enterprises shall only be entitled to take such action if (A) the relevant Person has filed a verified statement of the amounts owing and unpaid with the Enterprises in accordance with C.R.S. § 38-26-107 and (B) the Collateral Agent has not called upon such Contractor Bond to satisfy such payment obligations and the Collateral Agent does not call upon such Contractor Bond within 15 Working Days after written notice from the Enterprises of the Enterprises' intent to take such action. Neither the Collateral Agent nor the Enterprises shall be entitled to call on such Contractor Bond or to use any proceeds of any call on any such Contractor Bond to satisfy performance obligations of Developer or any Principal Subcontractor (as applicable) under the Project Agreement or relevant Principal Subcontract (as applicable) until any such outstanding payment obligations have been fully satisfied.

2.4 Collateral Agent Response to Project Agreement Amendment and Waiver Requests

To the extent that any Developer consent to the amendment to, or any waiver of the requirements of any provision of, the Project Agreement requires the Lenders' and/or the Collateral Agent's consent pursuant to the Financing Documents, the Collateral Agent agrees that in response to any written request from Developer for such a consent it shall:

(a) promptly seek instructions from the Lenders in accordance with the Financing Documents; and

(b) once instructed, promptly respond in writing to any such request.

2.5 Agreement to Act Reasonably

The Collateral Agent acknowledges and agrees that it shall act reasonably in responding to any Developer request to the Collateral Agent made under the Financing Documents to take any action, including the giving or withholding of any consent, approval or like assent, under the Project Agreement to the extent that Developer is required to act reasonably under such circumstances by the terms of the Project Agreement, provided that the Collateral Agent shall not be liable for breach of this provision to the extent it cannot comply due to the express and contrary instructions of the Lenders.

3. NOTICES

3.1 Enterprise Notices

(a) The Enterprises shall give the Collateral Agent notice (any such notice, an "Enterprise Notice") promptly upon becoming aware of the occurrence of any Developer Default (and shall provide a copy of such notice to Developer), and shall specify in the Enterprise Notice:

(i) the unperformed obligations of, and uncured breaches by, Developer under the Project Agreement of which the Enterprises are aware (having made reasonable inquiry) and the resulting potential grounds for termination of the Project Agreement in sufficient detail to enable Developer and the Collateral Agent to assess the scope and amount of any liability of Developer resulting therefrom;

(ii) all amounts due and payable by Developer to the Enterprises under the Project Agreement, if any, on or before the date of the Enterprise Notice and which remain unpaid at such date and the nature of Developer's obligation to pay such amounts; and

(iii) the amount of any payments that the Enterprises reasonably foresee shall become due and payable from Developer to the Enterprises under the Project Agreement during the relevant Cure Period.

(b) The Enterprises:

(i) may give the Collateral Agent multiple concurrently effective Enterprise Notices (and shall provide copies thereof to Developer);

(ii) may, in their discretion and without waiving their right to deliver a subsequent and contrary notice, expressly provide in any Enterprise Notice that such notice shall not constitute a notice of Developer Default for purposes of determining the start of any applicable Developer Default Cure Period pursuant to Section 32.1.1 of the Project Agreement; and

(iii) shall provide to the Collateral Agent (with copies thereof to Developer) updates to any Enterprise Notice given pursuant to Section 3.1(a) as and when they become aware of any unperformed obligations of, or any uncured breaches by, Developer (including non-payment of amounts that have become due) under the Project Agreement of the kind referenced in Sections 3.1(a)(i) and 3.1(a)(ii) that were not specified in the relevant Enterprise Notice or any prior updates thereto.

3.2 Collateral Agent Notices

The Collateral Agent shall:

(a) promptly upon becoming aware of any Event of Default, give the Enterprises notice of such event (a "Collateral Agent Notice") specifying the circumstances and nature of such event (and shall provide a copy of any such notice to Developer); and

(b) notify the Enterprises of any decision to accelerate any portion of the Project Debt or to exercise any enforcement remedies under the Financing Documents promptly upon the taking of such decision.

4. RIGHTS AND OBLIGATIONS DURING THE CURE PERIOD

4.1 Limitation on Enterprise Actions during the Cure Period

At any time during a Cure Period, the Enterprises shall not, subject to the terms of this Agreement:

(a) deliver a Termination Notice for Developer Default;

(b) directly or indirectly, take any action to initiate, or join in or support the initiation of, any Insolvency Event in respect of Developer, provided that, for certainty, if any Insolvency Event has occurred with respect to Developer (other than as a result of the Enterprises' breach of this Section 4.1(b)), this Section 4.1(b) shall not restrict or impair the ability of the Enterprises to participate in any related proceedings in order to preserve or protect their rights under the Project Agreement and/or their interests in the Project;

(c) suspend their performance under the Project Agreement, (including in connection with any Insolvency Event in respect of Developer) unless the grounds for suspension of performance arose during the Cure Period, provided that, for certainty, the Enterprises may exercise their rights to suspend the Work pursuant to Section 23.3 of the Project Agreement;

(d) notwithstanding anything to the contrary in Section 32.2.1.d. of the Project Agreement, but subject to Section 2.3(b), exercise its remedies as obligee or additional obligee (or beneficiary) under a Contractor Bond; or

(e) fail to pay any amount that becomes due and payable from them to Developer under the Project Agreement during such period into the Designated Account in accordance with Section 2.2(a).

4.2 Collateral Agent Rights

(a) At any time during the continuation of an Event of Default or a Developer Default (in the case of a Developer Default only, for so long as the Cure Period has not expired), without giving a Step-in Notice, the Collateral Agent may (but shall have no obligation to), at any time and at its discretion, perform or arrange for the performance of any act, duty or obligation required of Developer under the Project Agreement, or cure any breach of Developer thereunder or any Developer Default, which performance or cure by or on behalf of the Collateral Agent the Enterprises agree to accept in lieu of performance or cure by Developer (without prejudice to Developer's continued right to perform the relevant act, duty or obligation or cure the relevant breach or Developer Default) and in satisfaction of Developer's corresponding obligations. For certainty, to the extent that any breach of Developer under the Project Agreement is cured and/or any payment liabilities or obligations of Developer are performed by the Collateral Agent under this Section 4.2(a), such action shall discharge the relevant liabilities or obligations of Developer to the Enterprises.

(b) Subject to the terms of this Agreement, no performance or cure by or on behalf of the Collateral Agent in accordance with Section 4.2(a) shall be construed as an assumption by the Collateral Agent, or any person acting on the Collateral Agent's behalf, of any of the covenants, agreements or other obligations of Developer under the Project Agreement.

(c) The Collateral Agent may:

(i) give a Step-in Notice in accordance with the requirements of Section 5.1; or

(ii) give a Substitution Notice in accordance with the requirements of Section 6.1;

provided that the Collateral Agent delivers any such notice:

(iii) during a Cure Period; or

(iv) following the occurrence of an ongoing Event of Default that is not also a Developer Default.

5. STEP-IN ARRANGEMENTS

5.1 Step-in Notice

If at any time the Collateral Agent proposes that any Person become a joint and several obligor with Developer under the Project Agreement and this Agreement in accordance with the terms hereof (any such Person, a "Step-in Entity"), the effectiveness of such arrangement shall be conditional upon:

(a) the Collateral Agent giving a notice ("Step-in Notice") to the Enterprises, at any time that such notice delivery is permitted pursuant to Section 4.2(c), requesting the Enterprises' consent to the proposed Step-in Entity;

(b) the Enterprises' approval (or deemed approval) of the identity of the proposed Step-in Entity pursuant to Section 5.2; and

(c) the proposed Step-in Entity executing a Step-in Entity Accession Agreement in accordance with Section 5.3.

5.2 Grounds for Refusing Approval of Proposed Step-in Entity

(a) The Enterprises shall not be entitled to withhold their approval of any proposed Step-in Entity that is the subject of a Step-in Notice unless:

(i) the proposed Step-in Entity is disqualified, suspended or debarred, or subject to a proceeding to suspend or debar it, from bidding, proposing or contracting with any state-level, interstate or Federal Governmental Authority;

(ii) the proposed step-in is prohibited by statute, law or regulation; or

(iii) there is any outstanding Developer Default numbered (20) in Section 32.1.1 that has not been remedied or waived on or prior to the date of the Step-in Notice.

(b) The Enterprises shall be deemed to have approved any proposed Step-in Entity that is the subject of a Step-in Notice:

(i) in the case of any entity that is the Collateral Agent, a Lender or any of their respective Affiliates (including an entity wholly owned by a Lender or group of Lenders), on the fifth Working Day after the date on which the Enterprises receive the relevant Step-in Notice if the Enterprises have not responded to such notice within such period of time; and

(ii) in all other cases, on the 15th Working Day after the date on which the Enterprises receive the relevant Step-in Notice if the Enterprises have not responded to such notice within such period of time.

5.3 Step-in Date

If the Enterprises approve (or, pursuant to Section 5.2(b), are deemed to approve) a Step-in Entity pursuant to Section 5.2, the Step-in Entity shall be deemed to become a party to the Project Agreement and this Agreement on and from the date it executes a duly completed Step-in Entity Accession Agreement, substantially in the form attached hereto as Exhibit A, and submits it to Enterprises (the "Step-in Date").

5.4 Rights and Obligations on Step-in

(a) On and from the Step-in Date and during the Step-in Period, the Step-in Entity shall be:

(i) jointly and severally entitled to exercise and enjoy the rights and powers expressed to be assumed by or granted to Developer under the Project Agreement;

(ii) entitled to exercise and enjoy the rights and powers expressed to be assumed by or granted to a Step-in Entity under this Agreement; and

(iii) jointly and severally liable with Developer for the payment of all sums due from Developer under or arising out of the Project Agreement on or after the Step-in Date and for the performance of all of Developer's obligations (including payment obligations) under or arising out of the Project Agreement on or after the Step-in Date.

(b) Without prejudice to Section 8, during the Step-in Period:

(i) the Enterprises undertake:

(A) not to deliver a Termination Notice for Developer Default, unless the grounds for the termination arose during the Step-in Period as a result of the occurrence of a new Developer Default (with respect to any such new Developer Default that was not itself caused by the Step-in Entity, subject to the expiry of the Cure Period applicable to such new Developer Default without such Developer Default having been cured);

(B) not to, directly or indirectly, take any action to initiate, or join in or support the initiation of, any Insolvency Event in respect of Developer, provided that, for certainty, if any Insolvency Event has occurred with respect to Developer (other than as a result of the Enterprises' breach of this Section 5.4(b)(i)(B)), this Section 5.4(b)(i)(B) shall not restrict or impair the ability of the Enterprises to participate in any related proceedings in order to preserve or protect their rights under the Project Agreement and/or their interests in the Project;

(C) not to suspend their performance under the Project Agreement, (including in connection with any Insolvency Event in respect of Developer) unless the grounds for suspension of performance arose during the Step-in Period, provided that, for certainty, the Enterprises may exercise their rights to suspend the Work pursuant to Section 23.3 of the Project Agreement;

(D) notwithstanding anything to the contrary in Section 32.2.1.d. of the Project Agreement, but subject to Section 2.3(b) of this Agreement, not to exercise its remedies as obligee or additional obligee (or beneficiary) under a Contractor Bond; and

(E) to continue to make payments required to be made to Developer under the Project Agreement to the Designated Account;

(ii) the Enterprises shall owe their obligations under the Project Agreement to Developer and any Step-in Entity jointly, provided, that:

(A) subject to Section 5.4(b)(ii)(B), the performance of such obligations by the Enterprises in favor of either Developer or such Step-in Entity shall be a good and effective discharge of such obligations under the Project Agreement or this Agreement, as the case may be; and

(B) the Collateral Agent shall be entitled at any time by notice to the Enterprises to direct (such direction being binding on the Collateral Agent, the Enterprises and Developer) that, at all times thereafter while such Step-in Entity is deemed to be a party to the Project Agreement and this Agreement and subject to any further notice from the Collateral Agent, such Step-in Entity shall be solely entitled to make any decisions,

to give any directions, approvals or consents, to receive any payments or otherwise to deal with the Enterprises in the place of Developer under the Project Agreement and this Agreement.

(c) Developer shall not be relieved from any of its obligations under the Project Agreement, whether arising before or after the Step-in Date, by reason of the Step-in Entity becoming a party to the Project Agreement pursuant to a Step-in Entity Accession Agreement.

5.5 Step Out

(a) A Step-in Entity may, at any time, by giving not less than 30 Calendar Days' prior notice ("Step-out Notice") to the Enterprises, terminate its obligations to the Enterprises under the Project Agreement and this Agreement. Upon the expiry of such notice, the Step-in Entity shall no longer be deemed to be a party to the Project Agreement and this Agreement and shall (subject to Section 5.5(b)) be released from all such obligations. The obligations of the Enterprises to the Step-in Entity in such capacity under the Project Agreement and this Agreement shall also terminate upon the expiry of such notice.

(b) Nothing in this Section 5.5 shall have the effect of releasing a Step-in Entity from any liability that relates to the performance or non-performance of the Project Agreement or this Agreement by Developer or such Step-in Entity during the Step-in Period.

6. SUBSTITUTION PROPOSALS

6.1 Notice of Proposed Substitute

If at any time the Collateral Agent proposes to require Developer to assign its rights and transfer its obligations under the Project Agreement and this Agreement to a Person (a "Substitute") designated by the Collateral Agent (whether by mutual agreement or enforcement of rights under the Financing Documents), the effectiveness of such assignment and transfer shall be conditional upon:

(a) the Collateral Agent giving a notice (a "Substitution Notice") to the Enterprises, at any time that such notice delivery is permitted pursuant to Section 4.2(c), requesting their approval of the proposed Substitute;

(b) the Enterprises' approval of the identity of the proposed Substitute pursuant to Section 6.2 to the extent required thereunder; and

(c) the proposed Substitute executing a Substitute Accession Agreement in accordance with Section 7.1.

6.2 Grounds for Refusing Approval

(a) The Enterprises shall not be entitled to withhold, or (in circumstances where the Enterprises are entitled to withhold approval) make subject to the condition of the provision of additional security or other arrangements, their approval of any proposed Substitute that is the subject of a Substitution Notice, unless:

(i) the proposed Substitute is disqualified, suspended or debarred, or subject to a proceeding to suspend or debar it, from bidding, proposing or contracting with any state-level, interstate or Federal Governmental Authority;

(ii) the proposed substitution is prohibited by statute, law or regulation;

(iii) after the proposed substitution, the Substitute's ability to perform its obligations as Developer under the Project Agreement (including through the use of Subcontractors) would be insufficient to ensure performance of such obligations under the Project Agreement, a determination as to which the Enterprises may base upon or take into account (A) the legal capacity, power and authority of the Substitute to become a party to, and perform the obligations of Developer under the Project Agreement and (B) the resources (including committed financial resources), past performance, relevant experience and proposed subcontracting

arrangements of the proposed Substitute and, if applicable, of its proposed Subcontractors, in light of the then current performance requirements under the Project Agreement; or

(iv) subject to Section 7.4, there are outstanding Developer Defaults or breaches of the Project Agreement that have been previously notified by the Enterprises to the Collateral Agent, that either:

(A) have not, to the reasonable satisfaction of the Enterprises, been remedied or waived prior to the 30th Calendar Day after the date on which the Enterprises receive the information required pursuant to Section 6.3; or

(B) if not so remedied or waived, are not the subject of a plan approved by the Enterprises (such approval not to be unreasonably withheld, conditioned or delayed) specifying:

(I) subject to Section 6.2(a)(iv)(B)(II), the remedial action that the Substitute shall take after the Substitution Effective Date in order to remedy each such Developer Default or breach; and

(II) with respect to any such Developer Default or breach that is incapable of being cured by the proposed Substitute, the action(s) the Substitute shall take after the Substitution Effective Date in order to mitigate the material adverse effects (if any) of such Developer Default or breach on or in relation to the Project and to prevent such Developer Default or breach (if capable of repetition) from occurring in the future.

(b) The Enterprises shall be deemed to have approved any proposed Substitute that is the subject of a Substitution Notice on the 30th Calendar Day after the date on which the Enterprises receive the information required pursuant to Section 6.3 if the Enterprises have not responded to such notice within such period of time.

6.3 Provision of Information

The Collateral Agent shall promptly provide to the Enterprises such information in relation to (i) a proposed Substitute and (ii) any Person who it is proposed shall enter into a material Subcontract with the proposed Substitute in relation to the Project, as the Enterprises shall reasonably require to enable them to make their determination whether or not to provide their approval of the Substitute pursuant to Section 6.2, including:

(a) the name and address of the proposed Substitute;

(b) unless such proposed Substitute is a publicly traded entity, the names of the proposed Substitute's shareholders or members together with the share capital or partnership or membership interests, as the case may be, held by each of them;

(c) the manner in which the proposed Substitute will be financed and the extent to which such financing is committed (to the extent relevant);

(d) copies of the proposed Substitute's financial statements (audited, if available) for its three most recent financial years (or such shorter period as such entity has been in existence) or, in the case of a special purpose company, its opening balance sheet;

(e) a copy of the proposed Substitute's organizational documents; and

(f) details of the resources available to the proposed Substitute and the proposed Substitute's qualifications, experience and technical competence to perform the obligations of Developer under the Project Agreement, including the names, qualifications, experience and technical or other professional competence of the proposed Substitute's directors and any key personnel who will have responsibility for the day-to-day management of its participation in the Project.

7. SUBSTITUTION

7.1 Substitution Effective Date

If the Enterprises approve (or, pursuant to Section 6.2(b), are deemed to approve) a proposed Substitute pursuant to Section 6, the Substitute shall execute a duly completed Substitute Accession Agreement substantially in the form set out in Exhibit B to this Agreement and submit it to the Enterprises (with a copy to the Colorado State Controller and the other parties to this Agreement). Such agreement shall become effective on and from the earlier of (a) the date on which the Colorado State Controller or its designee countersigns the Substitute Accession Agreement and (b) the date that is 10 Calendar Days after the date on which the Colorado State Controller receives the completed Substitute Accession Agreement from Developer (the "Substitution Effective Date").

7.2 Effect of Substitution

On and from the Substitution Effective Date:

(a) the Substitute shall become a party to the Project Agreement and this Agreement in place of Developer;

(b) Developer shall be immediately released from its obligations arising under, and cease to be a party to, the Project Agreement and this Agreement;

(c) the Substitute shall exercise and enjoy the rights and perform the obligations of Developer under the Project Agreement and this Agreement, including, without limitation, any and all undischarged obligations of Developer that were the subject of any plan approved by the Enterprises pursuant to Section 6.2(a)(iv)(B); and

(d) the Enterprises shall owe their obligations (including any undischarged obligations of the Enterprises that were otherwise required to be performed by the Enterprises prior to the Substitution Effective Date) under the Project Agreement and this Agreement to such Substitute in place of (i) Developer and (ii) if a Step-in Date has previously occurred, any Step-in Entity.

7.3 Facilitation of Transfer

The Enterprises shall use Reasonable Efforts to facilitate the transfer to the Substitute of Developer's obligations under the Project Agreement and this Agreement.

7.4 Settlement of Outstanding Financial Liabilities

(a) The Substitute shall pay to the Enterprises any amount due from Developer to the Enterprises under the Project Agreement and this Agreement as of the Substitution Effective Date within 30 Calendar Days after such Substitution Effective Date (or, if later, within 30 Calendar Days after the date of notice from the Enterprises to the Substitute of such amount).

(b) If the Substitute fails to satisfy its obligations pursuant to Section 7.4(a), the Enterprises shall be entitled to exercise their rights under the Project Agreement in respect of the amount so due and unpaid.

7.5 Consequences of Substitution

On and from the Substitution Effective Date:

(a) subject to Section 7.4 and the Substitute's obligation to perform any and all undischarged obligations of Developer that were the subject of any plan approved by the Enterprises pursuant to Section 6.2(a)(iv)(B), any right of termination under the Project Agreement or this Agreement or any other right under the Project Agreement or this Agreement previously suspended by virtue of Section 4.1 and/or Section 5.4(b)(i) shall be of no further effect and the Enterprises shall not be entitled to terminate either the Project Agreement or this Agreement by virtue of any act, omission or circumstance (including any breach, Developer Default, Noncompliance Points, Construction Closure Deductions

or Operating Period Closure Deductions) that occurred or accrued prior to the Substitution Effective Date;

(b) if any Step-in Entity is a party to or has any obligations under the Project Agreement or this Agreement on the Substitution Effective Date, such Step-in Entity shall cease to be a party thereto and hereto and shall be discharged from all obligations thereunder and hereunder; and

(c) the Enterprises, the Collateral Agent and the Substitute (replacing Developer as a party) (each acting reasonably) shall enter into a direct agreement on substantially the same terms as this Agreement.

8. REINSTATEMENT OF REMEDIES

If:

(a) an Enterprise Notice has been given;

(b) the Developer Default that is the subject-matter of such notice is continuing and has not been remedied or waived by the Enterprises; and

(c) either:

(i) no Step-in Entity or Substitute becomes a party to the Project Agreement and this Agreement pursuant to Section 5.3 or 7.2(a), as applicable, prior to the relevant Cure Period Completion Date; or

(ii) a Step-in Entity becomes a party to the Project Agreement and this Agreement pursuant to Section 5.3, as applicable, prior to the relevant Cure Period Completion Date, but the Step-in Period relating to such Step-in Entity ends without a Substitute becoming a party thereto and hereto,

then, on and from the relevant Cure Period Completion Date, the Enterprises shall be entitled to:

(iii) pursuant to Section 32.2.1 of the Project Agreement, act upon any and all grounds for termination available to it in relation to the Project Agreement in respect of any Developer Defaults that have not been remedied or otherwise waived by the Enterprises;

(iv) pursue any and all available claims and exercise any and all available remedies against Developer; and

(v) take, initiate, join in or support any action of the type referred to in Section 4.1(b).

9. REJECTION OF THE PROJECT AGREEMENT IN BANKRUPTCY OR INSOLVENCY PROCEEDINGS

(a) If the Project Agreement is rejected by a trustee or debtor-in-possession, or terminated, as a result of any Insolvency Event involving Developer and, within 150 Calendar Days after such rejection or termination, the Collateral Agent shall so request and shall certify in writing to the Enterprises that the Collateral Agent or the Collateral Agent's Substitute intends to perform the obligations of Developer as and to the extent required under the Project Agreement, the Enterprises shall execute and deliver to the Collateral Agent (or, subject to prior compliance with the provisions of, and procedures set out in, Sections 6 and 7, any permitted Substitute) a new project agreement. Such new project agreement shall be on the same terms and conditions as the Project Agreement, except with respect to any obligations that have been fulfilled by Developer or by any party acting on behalf of or stepping-in for Developer prior to such rejection or termination. References in this Agreement to the "Project Agreement" shall be deemed also to refer to any such new project agreement as executed.

(b) The effectiveness of any new project agreement referred to in Section 9(a) shall be conditional upon the Collateral Agent first reimbursing the Enterprises in respect of their

costs incurred in connection with the execution and delivery of such new project agreement.

10. TERMINATION OF THIS AGREEMENT

This Agreement shall remain in effect until the earliest to occur of:

(a) the date on which all of the obligations of Developer under the Financing Documents have been irrevocably discharged in full to the satisfaction of the Collateral Agent;

(b) the date on which all of the parties' respective obligations and liabilities under the Project Agreement and this Agreement have expired or have been satisfied in accordance with the terms of the same; and

(c) any assignment and transfer to a Substitute has occurred pursuant to Sections 6 and 7 and the Enterprises, the Collateral Agent and the Substitute shall have entered into a direct agreement pursuant to Section 7.5(c).

11. PRESERVATION OF FUNDS

The Collateral Agent acknowledges the provisions of Section 25.5 (*Reinstatement*) of, and Section 4 of Schedule 12 (*Handback Requirements*) to, the Project Agreement.

12. COMPETING STEP-IN RIGHTS

12.1 Forbearance

Notwithstanding any provision in any Principal Subcontractor Direct Agreement to the contrary, the Enterprises agree that they shall not exercise any rights of step-in, novation or other similar rights they may have under any such Principal Subcontractor Direct Agreement until:[4]

(a) the Project Agreement has been terminated (other than pursuant to an assignment or transfer to a Substitute pursuant to Sections 6 and 7) or expired;

(b) any relevant period under any Lenders' Subcontract Direct Agreement during which the Collateral Agent is entitled to either exercise or procure the exercise of rights of step-in, novation, transfer or any similar right thereunder has expired; or

(c) if the Collateral Agent has exercised or procured the exercise of any such rights of step-in, novation, transfer or any similar right, the date of any step-out or similar event (howsoever defined) under the relevant Lenders' Subcontract Direct Agreement has occurred pursuant to which the Collateral Agent (on behalf of the Lenders) has voluntarily ceased to exercise such step-in, novation, transfer or similar rights.

12.2 Expiry of Lender Rights

(a) The Collateral Agent shall notify the Enterprises promptly after the date on which the Collateral Agent either:

(i) has determined (and the Collateral Agent shall so certify in such notice) that the Collateral Agent and the Lenders have exhausted; or

(ii) has determined (A) not to exercise (or to cease exercising) or (B) that, as a result of a release in full of the security interests referred to in Section 2.1(a), it and the Lenders are no longer entitled to exercise,

their direct or indirect legal rights and remedies pursuant to the Financing Documents or a Principal Subcontract against the related Principal Subcontractor, any guarantor of such Principal Subcontractor's obligations under the relevant Principal Subcontract and any provider of any Contractor Bond that has been provided by such Principal Subcontractor in favor of Developer in accordance with Section 9.3.2.b. of the Project Agreement, it being acknowledged that any determination to exercise, not to exercise or

[4] These provisions will be adjusted as needed to reflect the terms of the Lenders' Subcontract Direct Agreement(s), e.g., if there is no cure period thereunder.

to cease exercising any such legal rights and remedies shall be in the sole discretion of the Collateral Agent acting in accordance with the Financing Documents.

(b) Following receipt by the Enterprises of a notice from the Collateral Agent pursuant to Section 12.2(a) (the date of such receipt, the "Subordination Date"), all of the right, title and interest of the Collateral Agent (and each Lender) against:

(i) the relevant Principal Subcontractor;

(ii) any guarantor of such Principal Subcontractor's obligations under the relevant Principal Subcontract; and

(iii) any provider of any Contractor Bond that has been provided by such Principal Subcontractor in favor of Developer in accordance with Section 9.3.2.b. of the Project Agreement,

pursuant to the Financing Documents or any relevant Principal Subcontract, guaranty or Contractor Bond shall be subject and subordinated in all respects to all right, title and interest of the Enterprises pursuant to the relevant Principal Subcontractor Direct Agreement.

(c) Notwithstanding any provision in any Principal Subcontractor Direct Agreement to the contrary, the Enterprises agree that, prior to the Subordination Date, they shall not exercise any rights or remedies against any Principal Subcontractor under the related Principal Subcontractor Direct Agreement (other than rights of step-in, novation or other similar rights they are permitted to exercise pursuant to Section 12.1).

13. REPRESENTATIONS AND WARRANTIES

13.1 Representations and Warranties of Collateral Agent

(a) Each undersigned signatory for the Collateral Agent hereby represents and warrants that he or she has been duly authorized to execute and deliver this Agreement on behalf of the Collateral Agent.

(b) The Collateral Agent hereby represents and warrants that the Collateral Agent has full power and authority to execute, deliver and perform this Agreement.

(c) The Collateral Agent represents and warrants that this Agreement constitutes a legal, valid and binding obligation of it, enforceable against it in accordance with its terms, except to the extent limited by applicable bankruptcy, insolvency, reorganization, moratorium or other similar laws affecting the enforceability of the rights of creditors generally and by general principles of equity.

(d) The representations and warranties in Sections 13.1(a), (b) and (c) are made for the benefit of the Enterprises and Developer for the purpose of inducing the Enterprises and Developer to enter into this Agreement.

13.2 Representations and Warranties of Developer

(a) The undersigned signatory for Developer hereby represents and warrants that he or she has been duly authorized to execute and deliver this Agreement on behalf of Developer.

(b) Developer hereby represents and warrants that Developer has the limited liability company power and authority to execute, deliver and perform this Agreement.

(c) Developer represents and warrants that this Agreement constitutes a legal, valid and binding obligation of it, enforceable against it in accordance with its terms, except to the extent limited by applicable bankruptcy, insolvency, reorganization, moratorium or other similar laws affecting the enforceability of the rights of creditors generally and by general principles of equity.

(d) The representations and warranties in Sections 13.2(a) to (d) are made for the benefit of the Enterprises and the Collateral Agent for the purpose of inducing the Enterprises and the Collateral Agent to enter into this Agreement.

13.3 Representations and Warranties of the Enterprises

(a) Each undersigned signatory for each Enterprise hereby represents and warrants that he or she has been duly authorized to execute and deliver this Agreement on behalf of such Enterprise.

(b) Each Enterprise represents and warrants that it has the full power, right and authority to execute, deliver and perform each and all of its obligations under this Agreement.

(c) Each Enterprise represents and warrants that this Agreement constitutes a legal, valid and binding obligation of the Enterprises, enforceable against them in accordance with its terms, except to the extent limited by applicable bankruptcy, insolvency, reorganization, moratorium or other similar laws affecting the enforceability of the rights of creditors generally, by general principles of equity, by the exercise by the State and its governmental bodies of the police power inherent in the sovereignty of the State and by the exercise by the United States of the powers delegated to it by the Constitution of the United States.

(d) Each Enterprise represents and warrants that, as of the date of this Agreement, no Enterprise Default or, to its knowledge, Developer Default, has occurred and is continuing, and no fact or event exists that with the passage of time or giving of notice would constitute an Enterprise Default or, to its knowledge, a Developer Default.

(e) The representations and warranties in Sections 13.3(a) to (d) are made for the benefit of the Collateral Agent for the purpose of inducing the Collateral Agent to enter into this Agreement.

14. CHOICE OF LAW; JURISDICTION AND VENUE; DISPUTE RESOLUTION

14.1 Choice of Law

This Agreement shall be governed by and construed in accordance with the laws of the State of Colorado, other than any provision thereof that permits or requires the application of the laws of another jurisdiction, and regardless of any other jurisdiction's choice of law rules. Any provision incorporated herein by reference which purports to negate this provision or any other special provision set out in Section 15.14, in whole or in part, shall not be valid or enforceable or available in any action at law, whether by way of complaint, defense, or otherwise. Any provision rendered null and void by the operation of this provision shall not invalidate the remainder of this Agreement, to the extent capable of execution.

14.2 Jurisdiction and Venue

All suits or actions related to this Agreement shall be filed and proceedings held in the State and exclusive venue shall be in State or Federal court in the City of Denver, and each party hereto irrevocably waives:

(a) any objection which it may have at any time to the laying of venue of any such suit, action or proceeding brought in any such court;

(b) any claim that any such suit, action or proceeding has been brought in an inconvenient forum; and

(c) the right to object that such court does not have any jurisdiction with respect to such suit, action or proceeding.

15. GENERAL PROVISIONS

15.1 Amendments and Waivers

(a) This Agreement may only be amended by a written amendment duly executed by all parties together with, to the extent required by Law, the Colorado State Controller or its designee, unless the amendment to this Agreement is expressly allowed or required to be made in any other manner pursuant to this Agreement.

(b) Except to the extent otherwise expressly provided in this Agreement:

(i) any waiver of, or consent to any departure from, the requirements of any provision of this Agreement shall be approved in the discretion of the party giving it and shall be effective only if it is in writing by such party, and only in the specific instance, for the specific time, subject to the specific conditions and for the specific purpose for which it has been given;

(ii) no failure on the part of any party to exercise, and no delay in exercising, any right or power under this Agreement shall operate as a waiver of such right or power; and

(iii) no single or partial exercise of any right or power under this Agreement, including any right to give or withhold any consent or approval, nor any abandonment or discontinuance of steps to enforce such a right or power, shall preclude or render unnecessary any other or further exercise of such right or the exercise of any other right.

(c) For certainty, any waiver of any provision of this Agreement made by a party other than the Enterprises that would result in a violation of Part B of Schedule 16 (*Mandatory Terms*) to the Project Agreement shall be null and void unless approved by the Enterprises (in their discretion).

15.2 Successors and Assigns

(a) Except to the extent expressly provided hereunder, no party to this Agreement may assign or transfer any part of its rights or obligations hereunder without the prior written consent of the other parties, provided that the Collateral Agent may assign or transfer its rights and obligations hereunder in accordance with the terms of this Agreement to a successor Collateral Agent in accordance with the Financing Documents (in connection with which, the Enterprises agree to enter into a new direct agreement with the successor Collateral Agent on terms that are substantially the same as those of this Agreement).

(b) This Agreement shall be binding upon and inure to the benefit of the parties hereto and their respective successors and permitted assigns.

15.3 Severability

(a) If any provision (or part of any provision) of this Agreement is ruled invalid by a court having proper jurisdiction, then the parties shall:

(i) promptly meet and negotiate a substitute for such provision or part thereof which shall, to the greatest extent legally permissible, effect the original intent of the parties; and

(ii) if necessary or desirable, and to the extent the parties agree to do so, apply to the court which declared such invalidity for an interpretation of the invalidated provision (or part thereof) to guide the negotiations.

(b) If any provision (or part of any provision) of this Agreement shall, for any reason, be held to be invalid, illegal, or unenforceable in any respect, such provision (or part thereof) shall not affect the validity, legality and enforceability of any other provision of (or the other part of such provision) or any other documents referred to in this Agreement, and this

Agreement shall be construed as if such invalid, illegal, or unenforceable provision (or part thereof) had never been contained herein.

15.4 Entire Agreement

Subject to Section 1.3(b), this Agreement constitutes the entire agreement among the Enterprises, Developer and the Collateral Agent concerning the subject matter hereof and supersedes all prior negotiations, representations, and agreements, either oral or written, among the parties with respect to their subject matter.

15.5 Notices and Communications

(a) Any notice shall be given in writing by means of physical (including delivery by courier and postage pre-paid certified or registered mail), digital or electronic communication, but excluding the use of social media, messengering, broadcast and equivalent services, to the relevant party at the following addresses, as applicable:

Enterprises

HPTE	BE	Copy to
David I. Spector HPTE Director 4201 E. Arkansas Ave. Denver, CO 80222 (303) 757-9607 david.spector@state.co.us	Joshua Laipply, P.E. Chief Engineer 4201 E. Arkansas Ave. Denver, CO 80222 (303) 757-9204 joshua.laipply@state.co.us	Brent Butzin Assistant Attorney General Transportation Unit Ralph L. Carr Colorado Judicial Center 1300 Broadway, 10th Floor Denver, CO 80203 (720) 508-6638 Brent.Butzin@coag.gov

Developer	**Collateral Agent**
[*Attention*] Kiewit Meridiam Partners LLC 160 Inverness Drive West, Suite 110 Englewood, Colorado 80112 [*Phone*] [*Email*]	[*Attention*] [*Address*] [*Phone*] [*Email*]

(b) A notice shall be deemed to have been delivered and received:

(i) upon receipt (confirmed by automatic answer back, read receipt or equivalent evidence of receipt), if validly transmitted by digital or electronic distribution before 3:00 p.m. (local time at the place of receipt) on a Working Day;

(ii) on the next Working Day following receipt (confirmed by automatic answer back, read receipt or equivalent evidence of receipt), if validly transmitted by digital or electronic distribution on or after 3:00 p.m. (local time at the place of receipt) on a Working Day;

(iii) upon receipt, if physically delivered in person; or

(iv) if delivered by courier or postage pre-paid certified or registered mail, on the date of receipt as shown by the addressee's registry or certification receipt or on the date receipt at the appropriate address is refused, as shown on the records or manifest of the United States Postal Service or independent courier.

(c) The parties will notify each other in writing of any change of address and/or contact information, such notification to become effective five Working Days after notification.

15.6 Effect of Breach

Without prejudice to any rights a party may otherwise have, a breach of this Agreement shall not of itself give rise to a right to terminate the Project Agreement.

15.7 Counterparts

This Agreement (or an amendment or waiver in respect to this Agreement) may be executed in one or more counterparts (including by electronic signature and/or scanned or digital transmission). Any single counterpart or a set of counterparts executed, in either case, by each of the parties and, to the extent required by Law, the Colorado State Controller or its designee, shall constitute a full and original instrument for all purposes.

15.8 No Third Party Beneficiaries

It is not intended by any of the provisions of this Agreement to create any third party beneficiary rights hereunder. Notwithstanding the foregoing, the duties, obligations and responsibilities of the parties with respect to third parties shall remain as imposed by Law.

15.9 No Partnership

Nothing in this Agreement is intended or shall be construed to create any partnership, joint venture or similar relationship or among the parties. None of the parties shall hold itself out contrary to the terms of this Section 15.9.

15.10 No Interference

Developer joins in this Agreement to acknowledge and consent to the arrangements set out and agrees not to knowingly do or omit to do anything that may prevent any party from enforcing its rights under this Agreement.

15.11 Collateral Agent Liability

(a) Notwithstanding anything to the contrary in this Agreement, but subject to Sections 3.2, 5 (but solely to the extent the Collateral Agent or any of its Affiliates is the Step-In Entity), 13.1, 15.14(e), 15.14(f) and 15.14(h), the Collateral Agent shall not have any liability to the Enterprises under this Agreement, unless:

(i) the Collateral Agent expressly assumes such liability in writing; or

(ii) such liability arises as a result of or is made in response to any breach of Law or fraud, willful misconduct, criminal conduct, recklessness, bad faith or gross negligence by or of the Collateral Agent.

(b) The Enterprises acknowledge and agree that the Collateral Agent shall not be obligated or required to perform any of Developer's obligations under the Project Agreement, except during any Step-in Period and then solely to the extent the Collateral Agent or any of its Affiliates is the Step-In Entity.

15.12 No Personal Liability

Each Enterprise's authorized representatives, including the Enterprise Representative, are acting solely as agents and representatives of the Enterprises when carrying out the provisions of or exercising the power or authority granted to them under this Agreement, and, as such, none of them shall not be liable either personally or as employees of the Enterprises for actions in their ordinary course of employment.

15.13 Costs and Expenses of the Parties

Except as otherwise expressly provided in this Agreement or the Project Agreement, each party shall bear its own costs and expenses in connection with the preparation, negotiation, execution and performance of this Agreement and all other related agreements.

15.14 Special Provisions

(a) Controller's Approval

This Agreement shall not be valid until it has been approved by the Colorado State Controller or its designee.

(b) Governmental Immunity

No term or condition of this Agreement shall be construed or interpreted as a waiver, express or implied, of any of the immunities, rights, benefits, protections, or other provisions, of the Colorado Governmental Immunity Act, C.R.S. §§24-10-101 *et seq.*, or the Federal Tort Claims Act, 28 U.S.C. §§1346(b) and 2671 *et seq.*, as applicable now or hereafter amended.

(c) Compliance with Law

The Private Sector Parties shall strictly comply with all applicable Federal and State laws, rules, and regulations in effect or hereafter established, including, without limitation, laws applicable to discrimination and unfair employment practices.

(d) Binding Arbitration Prohibited

The State does not agree to binding arbitration by any extra-judicial body or person. Any provision to the contrary in this Agreement or incorporated herein by reference shall be null and void.

(e) Software Piracy Prohibition

State or other public funds payable under this Agreement shall not be used for the acquisition, operation, or maintenance of computer software in violation of federal copyright laws or applicable licensing restrictions. Each of the Private Sector Parties hereby certifies and warrants that, during the term of this Agreement and any extensions, such Private Sector Party has and shall maintain in place appropriate systems and controls to prevent such improper use of public funds. If the State determines that a Private Sector Party is in violation of this provision, the State may exercise any remedy available at law or in equity or under this Agreement, including, without limitation, termination of this Agreement, as well as any remedy consistent with Federal copyright laws or applicable licensing restrictions.

(f) Employee Financial Interest / Conflict of Interest

The signatories aver that, to their knowledge, no employee of the State has any personal or beneficial interest whatsoever in the service or property described in this Agreement. Neither Private Sector Party has any interest and shall acquire any interest, direct or indirect, that would conflict in any manner or degree with the performance of such Private Sector Party's services and no Private Sector Party shall employ any person having such known interests.

(g) Vendor Offset (C.R.S. §§24-30-202 (1) and 24-30-202.4)

Subject to C.R.S. §24-30-202.4 (3.5), the Colorado State Controller, or the Enterprises, may withhold payment under the State's vendor offset intercept system for debts owed to State agencies for:

(i) unpaid child support debts or child support arrearages;

(ii) unpaid balances of tax, accrued interest, or other charges specified in C.R.S. §39-21-101, *et seq.*;

(iii) unpaid loans due to the Student Loan Division of the Department of Higher Education;

(iv) amounts required to be paid to the Unemployment Compensation Fund pursuant to Article 70-82 of Title 8 of the C.R.S.; and

(v) other unpaid debts owing to the State as a result of final agency determination or judicial action.

(h) Public Contracts for Services

Each Private Sector Party certifies, warrants, and agrees that it does not knowingly employ or contract with an illegal alien who will perform work under this Agreement and will confirm the employment eligibility of all employees who are newly hired for employment in the United States to perform work under this Agreement, through participation in the E-Verify Program or the CDOT program established pursuant to C.R.S. §8-17.5-102(5)(c). Neither Private Sector Party shall knowingly employ or contract with an illegal alien to perform work under this Agreement or enter into a contract with a Subcontractor that fails to certify to such Private Sector Party that the Subcontractor shall not knowingly employ or contract with an illegal alien to perform work under this Agreement. Each Private Sector Party:

(i) shall not use E-Verify Program or CDOT program procedures to undertake pre-employment screening of job applicants while this Agreement is being performed;

(ii) shall notify the Subcontractor and the contracting State agency within three Calendar Days if such Private Sector Party has actual knowledge that a Subcontractor is employing or contracting with an illegal alien for work under this Agreement;

(iii) shall terminate the Subcontract if a Subcontractor does not stop employing or contracting with the illegal alien within three Calendar Days of receiving the notice; and

(iv) shall comply with reasonable requests made in the course of an investigation, undertaken pursuant to C.R.S. § 8-17.5-102(5), by the Colorado Department of Labor and Employment.

If a Private Sector Party participates in the CDOT program, such Private Sector Party shall deliver to the contracting State agency, institution of higher education or political subdivision a written, notarized affirmation, affirming that such Private Sector Party has examined the legal work status of such employee, and shall comply with all of the other requirements of the CDOT program. If a Private Sector Party fails to comply with any requirement of this provision or C.R.S. § 8-17.5-101, *et seq.*, the contracting State agency may terminate this Agreement for breach and, if so terminated, such Private Sector Party shall be liable for damages.

[*remainder of page left intentionally blank; signature page follows*]

[*To insert signature blocks*.]

Annex A
List of Financing Documents

A. Financing Agreements

1. [*Insert list at Financial Close*]

B. Security Documents

1. [*Insert list at Financial Close*]

Exhibit A
Form of Step-in Entity Accession Agreement

[*on Step-in Entity letterhead*]

[*Date*]

To: Colorado High Performance Transportation Enterprise
Colorado Bridge Enterprise

Cc: [ ]

From: [*Step-in Entity*]

Ladies and Gentlemen:

Reference is made to: (a) the Project Agreement for the Central 70 Project dated as of November 21, 2017 (as the same may be amended, modified or supplemented from time to time in accordance with its terms, the "Project Agreement") among the Colorado High Performance Transportation Enterprise and Colorado Bridge Enterprise (together, the "Enterprises") and Kiewit Meridiam Partners LLC (the "Developer"); and (b) the Direct Agreement dated as of [ ] (as the same may be amended, modified or supplemented from time to time in accordance with its terms, the "Direct Agreement"), among the Enterprises, Developer and [ ] as Collateral Agent (as defined therein).

Capitalized terms used but not defined in this Step-in Entity Accession Agreement shall have the meanings given to them in in the Direct Agreement.

1. We hereby confirm that: (a) we are a Step-in Entity pursuant to Section 5 of the Direct Agreement; and (b) this is a Step-in Entity Accession Agreement for purposes of the Direct Agreement.

2. We acknowledge and agree that, upon and by reason of our execution of this Step-in Entity Accession Agreement, we shall become a party as a Step-in Entity to the Project Agreement and the Direct Agreement jointly and severally with Developer and, accordingly, shall have the rights and powers and assume the obligations of Developer under the Project Agreement and the Direct Agreement in accordance with the terms of the Direct Agreement.

3. Our notice address and contact details for purposes of Section 15.5 of the Direct Agreement are as follows:

   [*Step-in Entity name*]
   [*Attention*]
   [*Address*]
   [*Phone*]
   [*Email*]

4. This Step-in Entity Accession Agreement shall be governed by and construed in accordance with the laws of the State of Colorado, other than any provision thereof that permits or requires the application of the laws of another jurisdiction, and regardless of any other jurisdiction's choice of law rules. Any provision incorporated herein by reference which purports to negate this provision, in whole or in part, shall not be valid or enforceable or available in any action at law, whether by way of complaint, defense, or otherwise. Any provision rendered null and void by the operation of this provision shall not invalidate the remainder of this Step-in Entity Accession Agreement, to the extent capable of execution.

5. All suits or actions related to this Step-in Entity Accession Agreement shall be filed and proceedings held in the State and exclusive venue shall be in State or Federal court in the City of Denver, and the Step-in Entity named below irrevocably waives:

   (a) any objection which it may have at any time to the laying of venue of any such suit, action or proceeding brought in any such court;

(b) any claim that any such suit, action or proceeding has been brought in an inconvenient forum; and

(c) the right to object that such court does not have any jurisdiction with respect to such suit, action or proceeding.

The terms set out herein are hereby agreed to:

[*To insert signature block for Step-in Entity*.]

Exhibit B
Form of Substitute Accession Agreement

[*on Substitute letterhead*]

[*Date*]

To: **Colorado High Performance Transportation Enterprise**
Colorado Bridge Enterprise

Cc: [ ]

From: [*Substitute*]

Ladies and Gentlemen:

Reference is made to: (a) the Project Agreement for the Central 70 Project dated as of November 21, 2017 (as the same may be amended, modified or supplemented from time to time in accordance with its terms, the "Project Agreement") among the Colorado High Performance Transportation Enterprise and Colorado Bridge Enterprise (together, the "Enterprises") and Kiewit Meridiam Partners LLC (the "Developer"); and (b) the Direct Agreement dated as of [ ] (as the same may be amended, modified or supplemented from time to time in accordance with its terms, the "Direct Agreement"), among the Enterprises, Developer and [ ] as Collateral Agent (as defined therein).

Capitalized terms used but not defined in this Substitute Accession Agreement shall have the meanings given to them in in the Direct Agreement.

1. We hereby confirm that: (a) we are a Substitute pursuant to Sections 6 and 7 of the Direct Agreement; and (b) this is a Substitute Accession Agreement for purposes of the Direct Agreement.

2. We acknowledge and agree that, pursuant to Section 7.1 of the Direct Agreement, we shall become a party as a Substitute to the Project Agreement and the Direct Agreement on and from the earlier of the date on which the Colorado State Controller countersigns this Substitute Accession Agreement and the date on which this Substitute Accession Agreement is otherwise deemed to be effective pursuant to Section 7.1 of the Direct Agreement and, accordingly, on and from the earlier of such dates we shall have the rights and powers and assume the obligations of Developer under the Project Agreement and the Direct Agreement in accordance with the terms of the Direct Agreement.

3. We hereby represent and warrant to the Enterprises that each representation and warranty made by Developer set out in Part A of Schedule 2 (*Representations and Warranties*) to the Project Agreement is true and correct as of the date hereof, except that, for such purposes, each reference to "Developer" shall be deemed to be a reference to us in our capacity as Substitute.

4. Our notice address and contact details for purposes of Section 15.5 of the Direct Agreement as follows:

   [*Substitute name*]
   [*Attention*]
   [*Address*]
   [*Phone*]
   [*Email*]

5. This Substitute Accession Agreement shall be governed by and construed in accordance with the laws of the State of Colorado, other than any provision thereof that permits or requires the application of the laws of another jurisdiction, and regardless of any other jurisdiction's choice of law rules. Any provision incorporated herein by reference which purports to negate this provision, in whole or in part, shall not be valid or enforceable or available in any action at law, whether by way of complaint, defense, or otherwise. Any provision rendered null and void by the operation of this provision shall not invalidate the remainder of this Substitute Accession Agreement, to the extent capable of execution.

6. All suits or actions related to this Substitute Accession Agreement shall be filed and proceedings held in the State and exclusive venue shall be in State or Federal court in the City of Denver, and each party hereto irrevocably waives:

   (a) any objection which it may have at any time to the laying of venue of any such suit, action or proceeding brought in any such court;

   (b) any claim that any such suit, action or proceeding has been brought in an inconvenient forum; and

   (c) the right to object that such court does not have any jurisdiction with respect to such suit, action or proceeding.

The terms set out herein are hereby agreed to:

[*To insert signature block for Substitute*.]

Agreed for and on behalf of:

[*To insert signature blocks for BE, HPTE and State Controller*.]

Part B: Form of Principal Subcontractor Direct Agreement

This [Construction / O&M][5] Contractor Direct Agreement (this "Agreement") is dated as of [ ] and made among:

(1) Colorado High Performance Transportation Enterprise ("HPTE"), a government-owned business within, and a division of, the Colorado Department of Transportation ("CDOT");

(2) Colorado Bridge Enterprise, a government-owned business within CDOT ("BE" and, together with HPTE, each individually an "Enterprise" and, together, the "Enterprises");

(3) Kiewit Meridiam Partners LLC, a limited liability company formed under the laws of the State of Delaware ("Developer");

(4) [ ], a [*describe type of legal entity and reference state of incorporation/organization*] ("Principal Subcontractor"); [and]

(5) [[ ], a [*describe type of legal entity and reference state of incorporation/organization*] and [ ], a [*describe type of legal entity and reference state of incorporation/organization*] ("Guarantors")][6].

RECITALS

Whereas:

(A) The Enterprises and Developer have entered into a Project Agreement for the Central 70 Project dated as of November 21, 2017 (as the same may be amended, modified or supplemented from time to time in accordance with its terms, the "Project Agreement"), in connection with the design, construction, financing, operation and maintenance of a portion of the I-70 East corridor in Greater Denver, Colorado (the "Project") as more fully described in the Project Agreement.

(B) The Principal Subcontractor, Developer [and the Guarantors] have entered into a [Construction / O&M] Contract for the Project dated as of [ ] (as the same may be amended, modified or supplemented from time to time in accordance with its terms, the "Principal Subcontract"), in connection with the [design and construction / operation and maintenance] of the Project as more fully described in the Principal Subcontract.

(C) [The Guarantors have provided to Developer a [payment and performance] guaranty dated as of [ ] (as the same may be amended, modified or supplemented from time to time in accordance with its terms, the "Guaranty") of the Principal Subcontractor's obligations under the Principal Subcontract.][7]

(D) It is a condition precedent to Financial Close under Schedule 1 (*Financial Close*) to the Project Agreement that the parties hereto execute this Agreement.

Now, therefore, in consideration of their mutual undertakings and agreements hereunder, and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties undertake and agree as follows:

1. DEFINITIONS, INTERPRETATION AND RELATIONSHIP TO PROJECT AGREEMENT

1.1 Definitions

(a) Capitalized terms used but not defined in this Agreement shall have the meanings given to them in Part A of Annex A (*Definitions and Abbreviations*) of the Project Agreement.

(b) Except as otherwise specified herein, or as the context may otherwise require, the following terms have the respective meanings set out below for all purposes of this Agreement:

[5] Form to be modified throughout where indicated to reflect execution by the Construction Contractor or the O&M Contractor. If necessary (depending on Developer's approach to Subcontracting the Work), refer to another type of Principal Subcontractor.
[6] To be modified as necessary to reflect the inclusion or absence of a Guarantor.
[7] Form to be modified throughout where indicated to reflect any Guaranty arrangements.

"Enterprise Step-in"	has the meaning given to it in Section 2.2(c)(iii).
"Enterprise Step-in Date"	has the meaning given to it in Section 2.2(c)(iii).
"Enterprise Step-in Rights Period"	has the meaning given to it in Section 2.2(c).
"Forbearance End Date"	means the date on which the Enterprises are first entitled to exercise rights of step-in, novation or other similar rights under this Agreement in accordance with Section 12.1 of the Lenders Direct Agreement.
["Guaranty"]	[has the meaning given to it in the Recitals.]
"Principal Subcontract"	has the meaning given to it in the Recitals.
"Private Sector Parties"	means Developer[,] [and] the Principal Subcontractor [and the Guarantors].
"Release Date"	means the later to occur of: (a) the Subordination Date (as defined in the Lenders Direct Agreement); and (b) [the Expiry Date (or, if earlier, the Termination Date)][8] [the Termination Date].[9]
"Subcontractor Bond"	means any Contractor Bond provided by the Principal Subcontractor in favor of Developer in accordance with Section 9.3.2.b. of the Project Agreement.

1.2 Interpretation

(a) Headings and other internal references

(i) Headings are inserted for convenience only and shall not affect interpretation of this Agreement.

(ii) Except as the context may otherwise provide, the words "herein", "hereof" and "hereunder", and words of similar import, shall be construed to refer to this Agreement in its entirety and not to any particular provision of it.

(iii) Except as otherwise expressly provided or as the context may otherwise provide, a reference to any Section within this Agreement is a reference to such Section of this Agreement.

(b) Common terms and references

(i) The singular includes the plural and vice versa.

(ii) Words preceding "include", "includes", "including" and "included" shall be construed without limitation by the words that follow.

(iii) The word "promptly" means as soon as reasonably practicable in light of then-prevailing circumstances.

(c) References to agreements, documents and Persons

[8] Delete with respect to the Construction Contract.
[9] Delete with respect to the O&M Contract.

Except as otherwise expressly provided in this Agreement, a reference:

(i) to an agreement or other document shall be construed to be a reference to such agreement or other document (including any schedules, annexes or exhibits thereto) as it may be amended, modified or supplemented from time to time in accordance with its terms and the terms of the Project Agreement;

(ii) to a Person includes such Person's permitted successors, assigns and transferees; and

(iii) where the Principal Subcontractor is at any time a consortium, partnership, joint venture or any other unincorporated grouping acting together for a common purpose, to the "Principal Subcontractor" shall be deemed to include reference to each and every member or partner of the same and the liability of each and every such member or partner under this Agreement shall be deemed to be joint and several.

(d) Discretion

Except as otherwise expressly provided in this Agreement, where this Agreement provides that any consent, approval or like assent is to be made or given in the "discretion" of a Person, it shall be made or given only in the sole and absolute discretion of such Person (which discretion includes the ability to refrain from giving, or to impose conditions on, such consent, approval or like assent), which discretionary decision regarding any consent, approval or like assent shall be final and binding and not subject to dispute other than with respect to:

(i) a good faith dispute concerning whether the consent, approval or like assent was discretionary; or

(ii) a breach of the implied covenant of good faith and fair dealing.

1.3 Relationship to Project Agreement

(a) In the event of any conflict, ambiguity or inconsistency between the provisions of (i) [either][any of] the Project Agreement[, the Guaranty] or the Principal Subcontract and (ii) the provisions of this Agreement, the provisions of this Agreement shall prevail.

(b) Notwithstanding the foregoing, nothing in this Agreement amends or modifies (i) any of Developer's obligations under the Project Agreement, (ii) any of the Principal Subcontractor's obligations under the Principal Subcontract [or (iii) any of the Guarantor's obligations under the Guaranty].

2. UNDERTAKINGS

2.1 Performance Standards

(a) The Principal Subcontractor [represents and warrants to the Enterprises that it has performed, and][10] hereby undertakes to perform[,] such portion of the Work that is the subject of the Principal Subcontract pursuant to and in compliance with the terms, conditions and requirements of:

(i) the Principal Subcontract; and

(ii) the Project Agreement, to the extent applicable in accordance with its terms or the terms of the Principal Subcontract,

provided that, without prejudice to Section 12.2(c) of the Lenders Direct Agreement, the Enterprises shall not be entitled to exercise against the Principal Subcontractor any rights or remedies to which they become entitled as a result of a breach of any of [the

[10] Delete representations and warranties if any Principal Subcontractor Direct Agreement is delivered simultaneously with the execution of the relevant Principal Subcontract.

representations and warranties or] undertakings made pursuant to this Section 2.1(a) until the earliest of:

(iii) the Forbearance End Date; and

(iv) the Release Date.

(b) The Enterprises agree that the Principal Subcontractor [and the Guarantors] shall:

(i) be entitled in any action or proceedings by the Enterprises in connection with, or as a result of having exercised their rights pursuant to, this Agreement to raise equivalent rights of defense of liability (except for set off or counterclaim) as [it / they] would have against Developer under[, respectively,] the Principal Subcontract [and the Guarantee]; and

(ii) have no liability under, or as a result of the Enterprises exercising their rights pursuant to, this Agreement that is of greater severity or of longer duration than [it / they] would have had if the Enterprises had been[, respectively,] a party to the Principal Subcontract as joint employer together with Developer [and a joint beneficiary of the Guaranty together with Developer].

2.2 Step-in Rights

(a) The Principal Subcontractor shall not exercise, or seek to exercise, any right which may be or becomes available to it to:

(i) terminate, or treat as terminated or repudiated, the Principal Subcontract or its engagement thereunder; or

(ii) suspend the performance of any of its obligations under the Principal Subcontract,

without first giving to the Enterprises at least 60 Calendar Days' (or, in the case of a payment default, 45 Calendar Days') prior notice in accordance with Section 2.2(b), provided that, if the expiry period of such notice occurs prior to the expiry of the Enterprise Step-in Rights Period, the Principal Subcontractor shall not be entitled to exercise, or seek to exercise, any such right(s) unless and until:

(iii) the Enterprises deliver a notice to the Principal Subcontractor pursuant to Section 2.2(c) during the Enterprise Step-in Rights Period initiating an Enterprise Step-in and subsequently the Enterprises fail to remedy the circumstances that gave rise to the delivery of the notice from the Principal Subcontractor by the date which is 30 Calendar Days after the Enterprise Step-in Date, in which case the Principal Subcontractor shall be entitled to exercise, or seek to exercise, any right then available to it under the Principal Subcontract as referred to in Sections 2.2(a)(i) and 2.2(a)(ii);

(iv) if the Enterprise Step-in Rights Period has begun but not yet expired, the occurrence of the 60th Calendar Day (or, in the case of a payment default, the 45th Calendar Day) after the Enterprises' receipt of a notice from the Principal Subcontractor pursuant to Section 2.2(a) without the Enterprises having delivered a notice to the Principal Subcontractor pursuant to Section 2.2(c) during the Enterprise Step-in Rights Period initiating an Enterprise Step-in, in which case the Principal Subcontractor shall be entitled to exercise, or seek to exercise, the right referred to in Section 2.2(a)(ii) if then available to it under the Principal Subcontract; or

(v) the Enterprise Step-in Rights Period has expired without the Enterprises having delivered a notice to the Principal Subcontractor pursuant to Section 2.2(c) during the Enterprise Step-in Rights Period initiating an Enterprise Step-in, in which case the Principal Subcontractor shall be entitled to exercise, or seek to

exercise, any right then available to it under the Principal Subcontract as referred to in Section 2.2(a)(i) and 2.2(a)(ii).

(b) Any notice given by the Principal Subcontractor to the Enterprises pursuant to Section 2.2(a) shall specify:

(i) the potential grounds for the Principal Subcontractor to exercise any right described in Sections 2.2(a)(i) or 2.2(a)(ii), together with details regarding any other unperformed obligations of, and uncured breaches by, Developer under the Principal Subcontract of which the Principal Subcontractor is aware;

(ii) all amounts due and payable by Developer to the Principal Subcontractor under the Principal Subcontract, if any, on or before the date of such notice and which remain unpaid at such date, and the nature of Developer's obligation to pay such amounts; and

(iii) the amount of any payments that the Principal Subcontractor reasonably foresees shall become due and payable from Developer to the Principal Subcontractor under the Principal Subcontract prior to the expiry of the Enterprise Step-in Rights Period.

(c) At any time during the period:

(i) on and from the earlier of:

(A) the date of the Enterprises' receipt of a notice (if any) from the Principal Subcontractor pursuant to Section 2.2(a); and

(B) the Forbearance End Date;

(ii) to and including (whether the earlier of the dates referred to in Section 2.2(c) is the date referred to in Section 2.2(c)(i)(A) or the date referred to in Section 2.2(c)(i)(B)) the later of:

(A) the 60th Calendar Day (or, in the case of a payment default, the 45th Calendar Day) after the Enterprises' receipt of a notice (if any) from the Principal Subcontractor pursuant to Section 2.2(a); and

(B) the 15th Calendar Day after the Forbearance End Date,

(the "Enterprise Step-in Rights Period"), the Enterprises shall give notice to the Principal Subcontractor [and the Guarantors] as to whether the Enterprises (or their designee):

(iii) shall from the date specified in such notice (the "Enterprise Step-in Date") (which specified date shall be no later than the last Calendar Day of such Enterprise Step-in Rights Period) assume all rights and obligations of, and succeed to the interests of, Developer under the Principal Subcontract[, the Guaranty] and any Subcontractor Bond to the exclusion and in place of Developer (an "Enterprise Step-in"), provided that, following any such assumption and succession, each of the Principal Subcontract [and the Guaranty] and any Subcontractor Bond shall remain in full force and effect; or

(iv) waive their rights to effect an Enterprise Step-in pursuant to Section 2.2(c)(iii).

(d) [Each of] the Principal Subcontractor [and the Guarantors] acknowledges and agrees that the Enterprises, in their discretion, shall have the right to require [it] [them]:

(i) following the occurrence of the Release Date, to consent to any assignment and transfer of the benefit of this Agreement[, the Guaranty] and the Principal Subcontract (including the benefit of all warranties and guarantees, express or implied, provided under the Principal Subcontract) pursuant to Section 34.2.1 of the Project Agreement;

(ii) to enter into a novation agreement or contract amendment to effect any Enterprise Step-in or any assignment and transfer referred to in Section 2.2(d)(i), provided that any such agreement, amendment, assignment or transfer shall be made subject to such terms and conditions as required by State Law to obtain the consent of the Colorado State Controller; and

(iii) to cause the issuer of any Subcontractor Bond to enter into such agreements or other documents as reasonably necessary to grant the Enterprises the benefits previously available to Developer under such Subcontractor Bond following any Enterprise Step-in or any assignment and transfer referred to in Section 2.2(d)(i).

(e) [Each of] the Principal Subcontractor [and the Guarantors] acknowledges and agrees [it] [they] shall not take any action (or refrain from taking any action) in a manner that is calculated or intended to directly or indirectly prejudice or frustrate any of the activities contemplated under Section 34.1 of the Project Agreement or any transfer or assignment contemplated under Section 34.2 of the Project Agreement and Section 2.2(d).

(f) If either:

(i) any assignment and transfer referred to in Section 2.2(d)(i) occurs; or

(ii) an Enterprise Step-in occurs,

the Enterprises shall accept liability for Developer's obligations under the relevant Principal Subcontract and shall as soon as practicable thereafter cure any outstanding breach by Developer which is capable of cure by Enterprises, in each case subject to Developer's rights under the terms of the relevant Principal Subcontract; provided that, with respect to any such breach that is incapable of being cured by the Enterprises, the Enterprises shall promptly following any such assignment and transfer or Enterprise Step-in, as applicable, provide a plan with respect to such breach specifying the action(s) they have taken or shall take in order to mitigate the material adverse effects (if any) of such breach on the Principal Subcontractor or in relation to the Principal Subcontractor and to prevent such breach (if capable of repetition) from occurring in the future.

(g) For certainty, but without prejudice to the Principal Subcontractor's rights and remedies under this Agreement, the Enterprises shall not be under any obligation to the Principal Subcontractor, nor shall the Principal Subcontractor have any claim or cause of action against the Enterprises, unless and until any assignment and transfer referred to in Section 2.2(d)(i) or an Enterprise Step-in occurs.

(h) Developer acknowledges and agrees that the Principal Subcontractor [and the Guarantors] shall [each] be entitled to rely on any notice or instruction given to it by the Enterprises' exercising their rights under this Agreement as conclusive evidence that the Enterprises are entitled to exercise such rights.

3. ENTERPRISES' REMEDIES

The rights and benefits conferred upon the Enterprises by this Agreement are in addition to: (a) any other rights and remedies they may have against Developer, the Principal Subcontractor [and/or the Guarantors]; and (b) any other rights and benefits they may have with respect to any Subcontractor Bond or any other Contractor Bond.

4. CHOICE OF LAW; JURISDICTION AND VENUE; DISPUTE RESOLUTION

4.1 Choice of Law

This Agreement shall be governed by and construed in accordance with the laws of the State of Colorado, other than any provision thereof that permits or requires the application of the laws of another jurisdiction, and regardless of any other jurisdiction's choice of law rules. Any provision incorporated herein by reference which purports to negate this provision or any other special provision set out in Section 5.12, in whole or in part, shall not be valid or enforceable or available in any action at law, whether by way of complaint, defense, or otherwise. Any provision rendered

null and void by the operation of this provision shall not invalidate the remainder of this Agreement, to the extent capable of execution.

4.2 Jurisdiction and Venue

All suits or actions related to this Agreement shall be filed and proceedings held in the State and exclusive venue shall be in State or Federal court in the City of Denver, and each party hereto irrevocably waives:

(a) any objection which it may have at any time to the laying of venue of any such suit, action or proceeding brought in any such court;

(b) any claim that any such suit, action or proceeding has been brought in an inconvenient forum; and

(c) the right to object that such court does not have any jurisdiction with respect to such suit, action or proceeding.

5. GENERAL PROVISIONS

5.1 Amendments and Waivers

(a) This Agreement may only be amended by a written amendment duly executed by all parties together with, to the extent required by Law, the Colorado State Controller or its designee, unless the amendment to this Agreement is expressly allowed or required to be made in any other manner pursuant to this Agreement.

(b) Except to the extent otherwise expressly provided in this Agreement:

(i) any waiver of, or consent to any departure from, the requirements of any provision of this Agreement shall be approved (in the discretion) of the party giving it and shall be effective only if it is in writing by such party, and only in the specific instance, for the specific time, subject to the specific conditions and for the specific purpose for which it has been given;

(ii) no failure on the part of any party to exercise, and no delay in exercising, any right or power under this Agreement shall operate as a waiver of such right or power; and

(iii) no single or partial exercise of any right or power under this Agreement, including any right to give or withhold any consent or approval, nor any abandonment or discontinuance of steps to enforce such a right or power, shall preclude or render unnecessary any other or further exercise of such right or the exercise of any other right.

5.2 Successors and Assigns

(a) No party to this Agreement may assign or transfer any part of its rights or obligations hereunder without the prior written consent of the other parties.

(b) This Agreement shall be binding upon and inure to the benefit of the parties hereto and their respective successors and permitted assigns.

5.3 Severability

(a) If any provision (or part of any provision) of this Agreement is ruled invalid by a court having proper jurisdiction, then the parties shall:

(i) promptly meet and negotiate a substitute for such provision or part thereof which shall, to the greatest extent legally permissible, effect the original intent of the parties; and

(ii) if necessary or desirable, and to the extent the parties agree to do so, apply to the court which declared such invalidity for an interpretation of the invalidated provision (or part thereof) to guide the negotiations.

(b) If any provision (or part of any provision) of this Agreement shall, for any reason, be held to be invalid, illegal, or unenforceable in any respect, such provision (or part thereof) shall not affect the validity, legality and enforceability of any other provision of (or the other part of such provision) or any other documents referred to in this Agreement, and this Agreement shall be construed as if such invalid, illegal, or unenforceable provision (or part thereof) had never been contained herein.

5.4 Entire Agreement

Subject to Section 1.3(b), this Agreement constitutes the entire agreement among the parties hereto concerning the subject matter hereof and supersedes all prior negotiations, representations, and agreements, either oral or written, among the parties with respect to their subject matter.

5.5 Notices and Communications

(a) Any notice shall be given in writing by means of physical (including delivery by courier and postage pre-paid certified or registered mail), digital or electronic communication, but excluding the use of social media, messengering, broadcast and equivalent services, to the relevant party at the following addresses, as applicable:

Enterprises

HPTE	BE	Copy to
David I. Spector HPTE Director 4201 E. Arkansas Ave. Denver, CO 80222 (303) 757-9607 david.spector@state.co.us	Joshua Laipply, P.E. Chief Engineer 4201 E. Arkansas Ave. Denver, CO 80222 (303) 757-9204 joshua.laipply@state.co.us	Brent Butzin Assistant Attorney General Transportation Unit Ralph L. Carr Colorado Judicial Center 1300 Broadway, 10th Floor Denver, CO 80203 (720) 508-6638 Brent.Butzin@coag.gov

Developer	**Principal Subcontractor**	**Guarantor**
[*Attention*] Kiewit Meridiam Partners LLC 160 Inverness Drive West, Suite 110 Englewood, Colorado 80112 [*Phone*] [*Email*]	[*Attention*] [*Address*] [*Phone*] [*Email*]	[*Attention*] [*Address*] [*Phone*] [*Email*]

(b) A notice shall be deemed to have been delivered and received:

(i) upon receipt (confirmed by automatic answer back, read receipt or equivalent evidence of receipt), if validly transmitted by digital or electronic distribution before 3:00 p.m. (local time at the place of receipt) on a Working Day;

(ii) on the next Working Day following receipt (confirmed by automatic answer back, read receipt or equivalent evidence of receipt), if validly transmitted by digital or electronic distribution on or after 3:00 p.m. (local time at the place of receipt) on a Working Day;

(iii) upon receipt, if physically delivered in person; or

(iv) if delivered by courier or postage pre-paid certified or registered mail, on the date of receipt as shown by the addressee's registry or certification receipt or on the

date receipt at the appropriate address is refused, as shown on the records or manifest of the United States Postal Service or independent courier.

(c) The parties shall notify each other in writing of any change of address and/or contact information, such notification to become effective five Working Days after notification.

5.6 Counterparts

This Agreement (or an amendment or waiver in respect to this Agreement) may be executed in one or more counterparts (including by electronic signature and/or scanned or digital transmission). Any single counterpart or a set of counterparts executed, in either case, by each of the parties and, to the extent required by Law, the Colorado State Controller or its designee, shall constitute a full and original instrument for all purposes.

5.7 No Third Party Beneficiaries

It is not intended by any of the provisions of this Agreement to create any third party beneficiary rights hereunder. Notwithstanding the foregoing, the duties, obligations and responsibilities of the parties with respect to third parties shall remain as imposed by Law.

5.8 No Partnership

Nothing in this Agreement is intended or shall be construed to create any partnership, joint venture or similar relationship or among the parties. None of the parties shall hold itself out contrary to the terms of this Section 5.8.

5.9 No Interference

Developer joins in this Agreement to acknowledge and consent to the arrangements set out and agrees not to knowingly do or omit to do anything that may prevent any party from enforcing its rights under this Agreement.

5.10 No Personal Liability

Each Enterprise's authorized representatives, including the Enterprise Representative, are acting solely as agents and representatives of the Enterprises when carrying out the provisions of or exercising the power or authority granted to them under this Agreement, and, as such, none of them shall not be liable either personally or as employees of the Enterprises for actions in their ordinary course of employment.

5.11 Costs and Expenses of the Parties

Except as otherwise expressly provided in this Agreement, the Project Agreement, the Principal Subcontract [or the Guaranty], each party shall bear its own costs and expenses in connection with the preparation, negotiation, execution and performance of this Agreement and all other related agreements.

5.12 Special Provisions

(a) Controller's Approval

This Agreement shall not be valid until it has been approved by the Colorado State Controller or its designee.

(b) Governmental Immunity

No term or condition of this Agreement shall be construed or interpreted as a waiver, express or implied, of any of the immunities, rights, benefits, protections, or other provisions, of the Colorado Governmental Immunity Act, C.R.S. §§24-10-101 *et seq.*, or the Federal Tort Claims Act, 28 U.S.C. §§1346(b) and 2671 *et seq.*, as applicable now or hereafter amended.

(c) Compliance with Law

The Private Sector Parties shall strictly comply with all applicable Federal and State laws, rules, and regulations in effect or hereafter established, including, without limitation, laws applicable to discrimination and unfair employment practices.

(d) Binding Arbitration Prohibited

The State does not agree to binding arbitration by any extra-judicial body or person. Any provision to the contrary in this Agreement or incorporated herein by reference shall be null and void.

(e) Software Piracy Prohibition

State or other public funds payable under this Agreement shall not be used for the acquisition, operation, or maintenance of computer software in violation of federal copyright laws or applicable licensing restrictions. Each of the Private Sector Parties hereby certifies and warrants that, during the term of this Agreement and any extensions, such Private Sector Party has and shall maintain in place appropriate systems and controls to prevent such improper use of public funds. If the State determines that a Private Sector Party is in violation of this provision, the State may exercise any remedy available at law or in equity or under this Agreement, including, without limitation, termination of this Agreement, as well as any remedy consistent with Federal copyright laws or applicable licensing restrictions.

(f) Employee Financial Interest / Conflict of Interest

The signatories aver that, to their knowledge, no employee of the State has any personal or beneficial interest whatsoever in the service or property described in this Agreement. Neither Private Sector Party has any interest and shall acquire any interest, direct or indirect, that would conflict in any manner or degree with the performance of such Private Sector Party's services and no Private Sector Party shall employ any person having such known interests.

(g) Vendor Offset (C.R.S. §§24-30-202 (1) and 24-30-202.4)

Subject to C.R.S. §24-30-202.4 (3.5), the Colorado State Controller, or the Enterprises, may withhold payment under the State's vendor offset intercept system for debts owed to State agencies for:

(i) unpaid child support debts or child support arrearages;

(ii) unpaid balances of tax, accrued interest, or other charges specified in C.R.S. §39-21-101, *et seq*.;

(iii) unpaid loans due to the Student Loan Division of the Department of Higher Education;

(iv) amounts required to be paid to the Unemployment Compensation Fund pursuant to Article 70-82 of Title 8 of the C.R.S.; and

(v) other unpaid debts owing to the State as a result of final agency determination or judicial action.

(h) Public Contracts for Services

Each Private Sector Party certifies, warrants, and agrees that it does not knowingly employ or contract with an illegal alien who will perform work under this Agreement and will confirm the employment eligibility of all employees who are newly hired for employment in the United States to perform work under this Agreement, through participation in the E-Verify Program or the CDOT program established pursuant to C.R.S. §8-17.5-102(5)(c). None of the Private Sector Parties shall knowingly employ or contract with an illegal alien to perform work under this Agreement or enter into a contract with a Subcontractor that fails to certify to such Private Sector Party that the

Subcontractor shall not knowingly employ or contract with an illegal alien to perform work under this Agreement. Each Private Sector Party:

(i) shall not use E-Verify Program or CDOT program procedures to undertake pre-employment screening of job applicants while this Agreement is being performed;

(ii) shall notify the Subcontractor and the contracting State agency within three Calendar Days if such Private Sector Party has actual knowledge that a Subcontractor is employing or contracting with an illegal alien for work under this Agreement;

(iii) shall terminate the subcontract if a Subcontractor does not stop employing or contracting with the illegal alien within three Calendar Days of receiving the notice; and

(iv) shall comply with reasonable requests made in the course of an investigation, undertaken pursuant to C.R.S. § 8-17.5-102(5), by the Colorado Department of Labor and Employment.

If a Private Sector Party participates in the CDOT program, such Private Sector Party shall deliver to the contracting State agency, institution of higher education or political subdivision a written, notarized affirmation, affirming that such Private Sector Party has examined the legal work status of such employee, and shall comply with all of the other requirements of the CDOT program. If a Private Sector Party fails to comply with any requirement of this provision or C.R.S. § 8-17.5-101, *et seq.*, the contracting State agency may terminate this Agreement for breach and, if so terminated, such Private Sector Party shall be liable for damages.

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[*To insert signature blocks*.]

Schedule 20
Forms of Contractor Bond

Part A: Form of Payment and Performance Surety Bond

PAYMENT AND PERFORMANCE BOND NO.: [ ]

SURETY:[1] [*name*], a [*legal status*]
[*address*]

PRINCIPAL:[2] [*name*], a [*legal status*]
[*address*]

OBLIGEE[S]: [3] [*name*], a [*legal status*]
[*address*]

BOND AMOUNT: $[ ]

DATE: [*date*]

APPLICABLE AGREEMENT[S]: [Principal][4] [Kiewit Meridiam Partners LLC, a limited liability company formed under the laws of the State of Delaware ("Developer")][5] has entered into the Project Agreement for the Central 70 Project dated as of November 21, 2017 (as the same may be amended, modified or supplemented from time to time in accordance with its terms, the "Project Agreement") with Colorado High Performance Transportation Enterprise ("HPTE"), a government-owned business within, and a division of, the Colorado Department of Transportation ("CDOT"), and Colorado Bridge Enterprise ("BE"), a government-owned business within CDOT, (HPTE and BE, together, the "Enterprises") for the design, construction, financing, operation and maintenance of a portion of the I-70 East Corridor in Greater Denver [(the "Project")][6].

[Principal has entered into [*Principal Subcontract name*] with Developer, dated as of [*date*] (as the same may be amended, modified or supplemented from time to time in accordance with its terms, the "Subcontract"), for [*description of the work performed*] in regards to the Project.][7]

It is a requirement under Section 9.3.1.a.[i][ii][8] of the Project Agreement [and under the terms of the Subcontract][9] that this payment and performance bond (this "Bond") be delivered.

---

[1] The surety must be an Eligible Surety as defined under the Project Agreement.
[2] Principal shall be Developer, if the Contractor Bond is delivered pursuant to Section 9.3.2.a of the Project Agreement. Principal shall be Principal Subcontractor, if the Contractor Bond is delivered pursuant to Section 9.3.2.b of the Project Agreement.
[3] Refer to the Enterprises, if the Contractor Bond is delivered pursuant to Section 9.3.2.a. Refer to Developer, if the Contractor Bond is delivered pursuant to Section 9.3.2.b of the Project Agreement.
[4] Delete if Contractor Bond is delivered pursuant to Section 9.3.2.b.
[5] Delete if Contractor Bond is delivered pursuant to Section 9.3.2.a.
[6] Delete if Contractor Bond is delivered pursuant to Section 9.3.2.a.
[7] Delete this paragraph if Contractor Bond is delivered pursuant to Section 9.3.2.a.
[8] Select appropriate reference.
[9] Delete if Contractor Bond is delivered pursuant to Section 9.3.2.a.

TERMS:

Section 1. The [Project Agreement] [Subcontract] [is] incorporated herein by reference.[10] All terms that are not defined in this Bond shall have the meaning ascribed to them in the [Project Agreement] [Subcontract].

Section 2. Principal and Surety, jointly and severally, bind themselves and their successors and assigns to the Obligee[s]:

(a) to pay for labor, laborers, materials, rental machinery, tools and equipment, and all other items that are described in C.R.S. §§ 38-26-101 through and including 38-26-110 (the "Contractor's Bonds Statute") furnished for use in the performance of the [Project Agreement] [the Subcontract]; and

(b) to perform the [Project Agreement] [the Subcontract].

Section 3. Surety's liability under this Bond shall not exceed:

(a) the Bond Amount specified above; and

(b) any costs or expenses payable under Section 8 below and any interest payable under the Contractor's Bonds Statute,

the aggregate amounts referred to in this Section 3(a) and (b) are referred to as the "Maximum Amount".

Section 4. No change, alteration, addition, omission, modification, supplement or extension of time to the Project Agreement [or to the Subcontract][11], or to the nature of the work to be performed thereunder including, without limitation, any extension of time for performance or any change of any terms of or extension of time for any payment pertaining or relating to the [Project Agreement][12] [Subcontract or to the Project Agreement][13], nor any fraud practiced by any other Person (other than any Obligee or any Additional Obligee), shall in any way affect the obligations of Surety under this Bond. Surety waives notice of any change, alteration, addition, omission, modification, supplement or extension of time.

Section 5. This Bond is intended for the benefit of all Persons named in the Contractor's Bond Statute including, without limitation, all direct and indirect Subcontractors of the Principal.

Section 6.

(a) Whenever Principal and Surety are notified by the Obligee[s] that Principal is in default in the performance of the [Project Agreement] [Subcontract] (other than with respect to payment obligations), Surety shall as soon as reasonably practicable in light of then-prevailing circumstances ("promptly"):

(i) remedy such default;

(ii) arrange for Principal, with the prior written consent of the Obligee[s], to perform and complete the work in accordance with the [Project Agreement] [Subcontract];

(iii) itself, through its agents or through independent contractors, perform and complete the work in accordance with the [Project Agreement] [Subcontract]; or

[10] Modify references to Project Agreement or Subcontract as needed throughout the Bond.
[11] Delete reference to the Subcontract if the Contractor Bond is delivered pursuant to Section 9.3.2.a of the Project Agreement; delete square brackets if the Contractor Bond is delivered pursuant to Section 9.3.2.b of the Project Agreement.
[12] Delete if Contractor Bond is delivered pursuant to Section 9.3.2.b.
[13] Delete if Contractor Bond is delivered pursuant to Section 9.3.2.a.

(iv) select a subcontractor or subcontractors to complete all applicable portions of the work for which a notice to proceed has been issued in accordance with the [Project Agreement] [Subcontract] and, using a procurement methodology provided by the Obligee[s], arrange for a contract between such subcontractor or subcontractors and the Obligee[s], and make available as work progresses (even if there is a default or a succession of defaults under such contract or contracts of completion arranged under this Section 6(a)(iv)) sufficient funds to pay the cost of completion, such funds not to exceed in aggregate, including, without limitation, other costs and damages for which Surety is liable hereunder, the Maximum Amount. Any new contract(s) entered into in fulfillment of this Section 6(a)(iv) may provide for a new bond for each new subcontractor, provided that the amount of any such bond (in aggregate with the amount of any other such bonds) will be the Maximum Amount under this Bond, less amounts paid under this Bond and less amounts paid under any successive bonds for substitute contractors authorized by the Enterprises. Each new subcontractor shall be required to tender its bond to the Enterprises in accordance with Section 9.3.1 of the Project Agreement for such amount.

(b) Whenever Principal and Surety are notified by the Obligee[s] that Principal or any Subcontractor (of any tier) of Principal is in breach of its payment obligations under any Subcontract, which notice shall be given only for undisputed amounts, Surety shall promptly pay for the same in an amount not exceeding the Maximum Amount.

Section 7. Correspondence or claims relating to this Bond shall be sent to Surety at the address listed above for Surety. Surety shall promptly notify the Obligee[s] of any claims relating to this Bond at the address[es] listed above for the Obligee[s].

Section 8. Surety agrees to indemnify, defend and hold the Obligee[s] harmless from and against all loss, damage, cost, or expense incurred by the Obligee[s] as a result of any claims made against or related to this Bond arising out of the bad faith actions of the Surety. If Surety is in breach of its obligations under this Bond, the Obligee[s] shall be entitled to all remedies available at law or in equity. Should the Obligee[s] commence litigation to enforce Surety's obligations under this Bond, Surety agrees that, in addition to paying its own costs and expenses of litigation, if it acted in bad faith or breached its obligations under this Bond, it shall also pay all the Obligee['s][s'] costs and expenses, including, without limitation, the Obligee['s][s'] reasonable attorneys' fees (including those of the Colorado Attorney General's Office). Surety agrees that venue and jurisdiction for any litigation relating to this Bond shall be in the federal or state courts in the City and County of Denver, Colorado.

Section 9. This Bond has been furnished by Surety on behalf of Principal to comply with the Contractor's Bond Statute and any provision in this Bond conflicting with said statutory requirements shall be deemed deleted and provisions conforming to such statutory requirements shall be deemed incorporated herein. Principal and Surety acknowledge and agree that the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

Section 10. [The Additional Obligee Rider attached hereto is incorporated fully herein.][14]

[***remainder of page left intentionally blank; signature page follows***]

[14] Delete section if the Contractor Bond is delivered pursuant to Section 9.3.2.a of the Project Agreement; delete square brackets if the Contractor Bond is delivered pursuant to Section 9.3.2.b of the Project Agreement.

IN WITNESS WHEREOF, Principal and Surety have caused this bond to be executed and delivered as of [*date*].

[*To insert signature blocks*.]

ADDITIONAL OBLIGEE RIDER[15]

ADDITIONAL OBLIGEE[S]:[16] [*name*], a [*legal status*]
[*address*]

DATE: [*date*]

RELATED BOND: This additional obligee rider is executed concurrently with and shall be attached to and form a part of the Payment and Performance Bond No. [ ] dated as of [*date*] (the "Bond") by and among [*name*] a [*legal status*] as Principal and [*name*] a [*legal status*] as Surety in the Bond Amount of $[*amount*].

TERMS:

Section 1. All terms that are not defined herein shall have the meaning ascribed to them in the Bond.

Section 2. The undersigned agree and stipulate that the above named "Additional Obligee[s]" shall be added to the Bond as named obligee[s], subject to the terms herein.

Section 3. The Additional Obligee[s] shall have the right to notify Surety and Principal, as applicable, that Principal is in default under the [Project Agreement] [Subcontract] and/or that Principal or any Subcontractor (of any tier) of Principal is in breach of its payment obligations under any Subcontract, which notice with respect to any such breach of payment obligations shall be given only for undisputed amounts. Upon such notice by an Additional Obligee, Surety shall promptly act as if such notice was provided by the Obligee[s] and shall act in accordance with Section 6 of the Bond. Surety shall promptly notify the Obligee[s] of any claims by Additional Obligees relating to this Bond at the address listed in the Bond for the Obligee[s].

Section 4. The aggregate liability of Surety under this Bond, to any or all of the obligees, as their interests may appear, is limited to the Maximum Amount of said Bond.

Section 5. Additional Obligees' rights hereunder are subject to the same defenses Principal and/or Surety have against the Obligee[s].

Section 6. Except as modified herein, the Bond shall be and remains in full force and effect.

[***remainder of page left intentionally blank; signature page follows***]

[15] Refer to footnote on Section 10 of the Bond.
[16] If the Contractor Bond is delivered pursuant to Section 9.3.2.b of the Project Agreement: (i) the Additional Obligees will be the Enterprises and (ii) the Collateral Agent/Lender(s) may also be Additional Obligees as required by the Financing Documents.

IN WITNESS WHEREOF, Principal and Surety have caused this bond to be executed and delivered as of [*date*].

[*To insert signature blocks*.]

Part B: Form of Payment Bond

PAYMENT BOND NO.: [ ]

SURETY:[17] [*name*], a [*legal status*]
[*address*]

PRINCIPAL:[18] [*name*], a [*legal status*]
[*address*]

OBLIGEE[S]: [19] [*name*], a [*legal status*]
[*address*]

BOND AMOUNT: $[ ]

DATE: [*date*]

APPLICABLE AGREEMENT[S]: [Principal][20] [Kiewit Meridiam Partners LLC, a limited liability company formed under the laws of the State of Delaware ("Developer")][21] has entered into the Project Agreement for the Central 70 Project dated as of November 21, 2017 (as the same may be amended, modified or supplemented from time to time in accordance with its terms, the "Project Agreement") with Colorado High Performance Transportation Enterprise ("HPTE"), a government-owned business within, and a division of, the Colorado Department of Transportation ("CDOT"), and Colorado Bridge Enterprise ("BE"), a government-owned business within CDOT, (HPTE and BE, together, the "Enterprises") for the design, construction, financing, operation and maintenance of a portion of the I-70 East Corridor in Greater Denver [(the "Project")][22].

[Principal has entered into [*Principal Subcontract name*] with Developer, dated as of [*date*] (as the same may be amended, modified or supplemented from time to time in accordance with its terms, the "Subcontract"), for [*description of the work performed*] in regards to the Project.][23]

It is a requirement under Section 9.3.1.a.[i][ii][24] of the Project Agreement [and under the terms of the Subcontract][25] that this payment bond (this "Bond") be delivered.

TERMS:

Section 1. The [Project Agreement] [Subcontract] [is] incorporated herein by reference.[26] All terms that are not defined in this Bond shall have the meaning ascribed to them in the [Project Agreement] [Subcontract].

---

[17] The surety must be an Eligible Surety as defined under the Project Agreement.
[18] Principal shall be Developer, if the Contractor Bond is delivered pursuant to Section 9.3.2.a of the Project Agreement. Principal shall be Principal Subcontractor, if the Contractor Bond is delivered pursuant to Section 9.3.2.b of the Project Agreement.
[19] Refer to the Enterprises, if the Contractor Bond is delivered pursuant to Section 9.3.2.a. Refer to Developer, if the Contractor Bond is delivered pursuant to Section 9.3.2.b of the Project Agreement.
[20] Delete if Contractor Bond is delivered pursuant to Section 9.3.2.b.
[21] Delete if Contractor Bond is delivered pursuant to Section 9.3.2.a.
[22] Delete if Contractor Bond is delivered pursuant to Section 9.3.2.a.
[23] Delete this paragraph if Contractor Bond is delivered pursuant to Section 9.3.2.a.
[24] Select appropriate reference.
[25] Delete if Contractor Bond is delivered pursuant to Section 9.3.2.a.
[26] Modify references to Project Agreement or Subcontract as needed throughout the Bond.

Section 2. Principal and Surety, jointly and severally, bind themselves and their successors and assigns to the Obligee[s] to pay for labor, laborers, materials, rental machinery, tools and equipment, and all other items that are described in C.R.S. §§ 38-26-101 through and including 38-26-110 (the "Contractor's Bonds Statute") furnished for use in the performance of the [Project Agreement] [the Subcontract].

Section 3. Surety's liability under this Bond shall not exceed:

(a) the Bond Amount specified above; and

(b) any costs or expenses payable under Section 8 below and any interest payable under the Contractor's Bonds Statute,

the aggregate amounts referred to in this Section 3(a) and (b) are referred to as the "Maximum Amount".

Section 4. No change, alteration, addition, omission, modification, supplement or extension of time to the Project Agreement [or to the Subcontract][27], or to the nature of the work to be performed thereunder including, without limitation, any extension of time for performance or any change of any terms of the [Project Agreement][28] [Subcontract or to the Project Agreement][29], nor any fraud practiced by any other Person (other than any Obligee or any Additional Obligee), shall in any way affect the obligations of Surety under this Bond. Surety waives notice of any change, alteration, addition, omission, modification, supplement or extension of time.

Section 5. This Bond is intended for the benefit of all Persons named in the Contractor's Bond Statute including, without limitation, all direct and indirect Subcontractors of the Principal.

Section 6. Whenever Principal and Surety are notified by the Obligee[s] that Principal or any Subcontractor (of any tier) of Principal is in breach of its payment obligations under any Subcontract, which notice shall be given only for undisputed amounts, Surety shall promptly pay for the same in an amount not exceeding the Maximum Amount.

Section 7. Correspondence or claims relating to this Bond shall be sent to Surety at the address listed above for Surety. Surety shall promptly notify the Obligee[s] of any claims relating to this Bond at the address[es] listed above for the Obligee[s].

Section 8. Surety agrees to indemnify, defend and hold the Obligee[s] harmless from and against all loss, damage, cost, or expense incurred by the Obligee[s] as a result of any claims made against or related to this Bond arising out of the bad faith actions of the Surety. If Surety is in breach of its obligations under this Bond, the Obligee[s] shall be entitled to all remedies available at law or in equity. Should the Obligee[s] commence litigation to enforce Surety's obligations under this Bond, Surety agrees that, in addition to paying its own costs and expenses of litigation, if it acted in bad faith or breached its obligations under this Bond, it shall also pay all the Obligee['s][s'] costs and expenses, including, without limitation, the Obligee['s][s'] reasonable attorneys' fees (including those of the Colorado Attorney General's Office). Surety agrees that venue and jurisdiction for any litigation relating to this Bond shall be in the federal or state courts in the City and County of Denver, Colorado.

Section 9. This Bond has been furnished by Surety on behalf of Principal to comply with the Contractor's Bond Statute and any provision in this Bond conflicting with said statutory requirements shall be deemed deleted and provisions conforming to such statutory requirements shall be deemed incorporated herein. Principal and Surety acknowledge

[27] Delete reference to the Subcontract if the Contractor Bond is delivered pursuant to Section 9.3.2.a of the Project Agreement; delete square brackets if the Contractor Bond is delivered pursuant to Section 9.3.2.b of the Project Agreement.
[28] Delete if Contractor Bond is delivered pursuant to Section 9.3.2.b.
[29] Delete if Contractor Bond is delivered pursuant to Section 9.3.2.a.

and agree that the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

Section 10. [The Additional Obligee Rider attached hereto is incorporated fully herein.][30]

[***remainder of page left intentionally blank; signature page follows***]

[30] Delete section if the Contractor Bond is delivered pursuant to Section 9.3.2.a of the Project Agreement; delete square brackets if the Contractor Bond is delivered pursuant to Section 9.3.2.b of the Project Agreement.

IN WITNESS WHEREOF, Principal and Surety have caused this bond to be executed and delivered as of [*date*].

[*To insert signature blocks*.]

ADDITIONAL OBLIGEE RIDER[31]

ADDITIONAL OBLIGEE[S]:[32] [*name*], a [*legal status*]
[*address*]

DATE: [*date*]

RELATED BOND: This additional obligee rider is executed concurrently with and shall be attached to and form a part of the Payment Bond No. [ ] dated as of [*date*] (the "Bond") by and among [*name*] a [*legal status*] as Principal and [*name*] a [*legal status*] as Surety in the Bond Amount of $[*amount*].

TERMS:

Section 1. All terms that are not defined herein shall have the meaning ascribed to them in the Bond.

Section 2. The undersigned agree and stipulate that the above named "Additional Obligee[s]" shall be added to the Bond as named obligee[s], subject to the terms herein.

Section 3. The Additional Obligee[s] shall have the right to notify Surety and Principal that Principal or any Subcontractor (of any tier) of Principal is in breach of its payment obligations under any Subcontract, which notice shall be given only for undisputed amounts. Upon such notice by an Additional Obligee, Surety shall promptly act as if such notice was provided by the Obligee[s] and shall act in accordance with Section 6 of the Bond. Surety shall promptly notify the Obligee[s] of any claims by Additional Obligees relating to this Bond at the address listed in the Bond for the Obligee[s].

Section 4. The aggregate liability of Surety under this Bond, to any or all of the obligees, as their interests may appear, is limited to the Maximum Amount of said Bond.

Section 5. Additional Obligees' rights hereunder are subject to the same defenses Principal and/or Surety have against the Obligee[s].

Section 6. Except as modified herein, the Bond shall be and remains in full force and effect.

[***remainder of page left intentionally blank; signature page follows***]

[31] Refer to footnote on Section 10 of the Bond.
[32] If the Contractor Bond is delivered pursuant to Section 9.3.2.b of the Project Agreement: (i) the Additional Obligees will be the Enterprises and (ii) the Collateral Agent/Lender(s) may also be Additional Obligees as required by the Financing Documents.

IN WITNESS WHEREOF, Principal and Surety have caused this bond to be executed and delivered as of [*date*].

[*To insert signature blocks*.]

Part C: Form of Performance Surety Bond

PERFORMANCE BOND NO.: [ ]

SURETY:[33] [*name*], a [*legal status*]
[*address*]

PRINCIPAL:[34] [*name*], a [*legal status*]
[*address*]

OBLIGEE[S]: [35] [*name*], a [*legal status*]
[*address*]

BOND AMOUNT: $[ ]

DATE: [*date*]

APPLICABLE AGREEMENT[S]: [Principal][36] [Kiewit Meridiam Partners LLC, a limited liability company formed under the laws of the State of Delaware ("Developer")][37] has entered into the Project Agreement for the Central 70 Project dated as of November 21, 2017 (as the same may be amended, modified or supplemented from time to time in accordance with its terms, the "Project Agreement") with Colorado High Performance Transportation Enterprise ("HPTE"), a government-owned business within, and a division of, the Colorado Department of Transportation ("CDOT"), and Colorado Bridge Enterprise ("BE"), a government-owned business within CDOT, (HPTE and BE, together, the "Enterprises") for the design, construction, financing, operation and maintenance of a portion of the I-70 East Corridor in Greater Denver [(the "Project")][38].

[Principal has entered into [*Principal Subcontract name*] with Developer, dated as of [*date*] (as the same may be amended, modified or supplemented from time to time in accordance with its terms, the "Subcontract"), for [*description of the work performed*] in regards to the Project.][39]

It is a requirement under Section 9.3.1.a.[i][ii][40] of the Project Agreement [and under the terms of the Subcontract][41] that this performance bond (this "Bond") be delivered.

TERMS:

Section 1. The [Project Agreement] [Subcontract] [is] incorporated herein by reference.[42] All terms that are not defined in this Bond shall have the meaning ascribed to them in the [Project Agreement] [Subcontract].

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[33] The surety must be an Eligible Surety as defined under the Project Agreement.
[34] Principal shall be Developer, if the Contractor Bond is delivered pursuant to Section 9.3.2.a of the Project Agreement. Principal shall be Principal Subcontractor, if the Contractor Bond is delivered pursuant to Section 9.3.2.b of the Project Agreement.
[35] Refer to the Enterprises, if the Contractor Bond is delivered pursuant to Section 9.3.2.a. Refer to Developer, if the Contractor Bond is delivered pursuant to Section 9.3.2.b of the Project Agreement.
[36] Delete if Contractor Bond is delivered pursuant to Section 9.3.2.b.
[37] Delete if Contractor Bond is delivered pursuant to Section 9.3.2.a.
[38] Delete if Contractor Bond is delivered pursuant to Section 9.3.2.a.
[39] Delete this paragraph if Contractor Bond is delivered pursuant to Section 9.3.2.a.
[40] Select appropriate reference.
[41] Delete if Contractor Bond is delivered pursuant to Section 9.3.2.a.
[42] Modify references to Project Agreement or Subcontract as needed throughout the Bond.

Section 2. Principal and Surety, jointly and severally, bind themselves and their successors and assigns to the Obligee[s] to perform the [Project Agreement] [the Subcontract].

Section 3. Surety's liability under this Bond shall not exceed:

(a) the Bond Amount specified above; and

(b) any costs or expenses payable under Section 8 below and any interest payable under the Contractor's Bonds Statute,

the aggregate amounts referred to in this Section 3(a) and (b) are referred to as the "Maximum Amount".

Section 4. No change, alteration, addition, omission, modification, supplement or extension of time to the Project Agreement [or to the Subcontract][43], or to the nature of the work to be performed thereunder including, without limitation, any extension of time for performance or any change of any terms of or extension of time for any payment pertaining or relating to the [Project Agreement][44] [Subcontract or to the Project Agreement][45], nor any fraud practiced by any other Person (other than any Obligee or any Additional Obligee), shall in any way affect the obligations of Surety under this Bond. Surety waives notice of any change, alteration, addition, omission, modification, supplement or extension of time.

Section 5. Whenever Principal and Surety are notified by the Obligee[s] that Principal is in default in the performance of the [Project Agreement] [Subcontract] (other than with respect to payment obligations), Surety shall as soon as reasonably practicable in light of then-prevailing circumstances ("promptly"):

(a) remedy such default;

(b) arrange for Principal, with the prior written consent of the Obligee[s], to perform and complete the work in accordance with the [Project Agreement] [Subcontract];

(c) itself, through its agents or through independent contractors, perform and complete the work in accordance with the [Project Agreement] [Subcontract]; or

(d) select a subcontractor or subcontractors to complete all applicable portions of the work for which a notice to proceed has been issued in accordance with the [Project Agreement] [Subcontract] and, using a procurement methodology provided by the Obligee[s], arrange for a contract between such subcontractor or subcontractors and the Obligee[s], and make available as work progresses (even if there is a default or a succession of defaults under such contract or contracts of completion arranged under this Section 5(d)) sufficient funds to pay the cost of completion, such funds not to exceed in aggregate, including, without limitation, other costs and damages for which Surety is liable hereunder, the Maximum Amount. Any new contract(s) entered into in fulfillment of this Section 5(d) may provide for a new bond for each new subcontractor, provided that the amount of any such bond (in aggregate with the amount of any other such bonds) will be the Maximum Amount under this Bond, less amounts paid under this Bond and less amounts paid under any successive bonds for substitute contractors authorized by the Enterprises. Each new subcontractor shall be required to tender its bond to the Enterprises in accordance with Section 9.3.1 of the Project Agreement for such amount.

[43] Delete reference to the Subcontract if the Contractor Bond is delivered pursuant to Section 9.3.2.a of the Project Agreement; delete square brackets if the Contractor Bond is delivered pursuant to Section 9.3.2.b of the Project Agreement.
[44] Delete if Contractor Bond is delivered pursuant to Section 9.3.2.b.
[45] Delete if Contractor Bond is delivered pursuant to Section 9.3.2.a.

Section 6. Correspondence or claims relating to this Bond shall be sent to Surety at the address listed above for Surety. Surety shall promptly notify the Obligee[s] of any claims relating to this Bond at the address[es] listed above for the Obligee[s].

Section 7. Surety agrees to indemnify, defend and hold the Obligee[s] harmless from and against all loss, damage, cost, or expense incurred by the Obligee[s] as a result of any claims made against or related to this Bond arising out of the bad faith actions of the Surety. If Surety is in breach of its obligations under this Bond, the Obligee[s] shall be entitled to all remedies available at law or in equity. Should the Obligee[s] commence litigation to enforce Surety's obligations under this Bond, Surety agrees that, in addition to paying its own costs and expenses of litigation, if it acted in bad faith or breached its obligations under this Bond, it shall also pay all the Obligee['s][s'] costs and expenses, including, without limitation, the Obligee['s][s'] reasonable attorneys' fees (including those of the Colorado Attorney General's Office). Surety agrees that venue and jurisdiction for any litigation relating to this Bond shall be in the federal or state courts in the City and County of Denver, Colorado.

Section 8. This Bond has been furnished by Surety on behalf of Principal to comply with the Contractor's Bond Statute and any provision in this Bond conflicting with said statutory requirements shall be deemed deleted and provisions conforming to such statutory requirements shall be deemed incorporated herein. Principal and Surety acknowledge and agree that the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

Section 9. [The Additional Obligee Rider attached hereto is incorporated fully herein.][46]

[***remainder of page left intentionally blank; signature page follows***]

[46] Delete section if the Contractor Bond is delivered pursuant to Section 9.3.2.a of the Project Agreement; delete square brackets if the Contractor Bond is delivered pursuant to Section 9.3.2.b of the Project Agreement.

IN WITNESS WHEREOF, Principal and Surety have caused this bond to be executed and delivered as of [*date*].

[*To insert signature blocks*.]

ADDITIONAL OBLIGEE RIDER[47]

ADDITIONAL OBLIGEE[S]:[48] [*name*], a [*legal status*]
[*address*]

DATE: [*date*]

RELATED BOND: This additional obligee rider is executed concurrently with and shall be attached to and form a part of the Performance Bond No. [ ] dated as of [*date*] (the "Bond") by and among [*name*] a [*legal status*] as Principal and [*name*] a [*legal status*] as Surety in the Bond Amount of $[*amount*].

TERMS:

Section 1. All terms that are not defined herein shall have the meaning ascribed to them in the Bond.

Section 2. The undersigned agree and stipulate that the above named "Additional Obligee[s]" shall be added to the Bond as named obligee[s], subject to the terms herein.

Section 3. The Additional Obligee[s] shall have the right to notify Surety and Principal that Principal is in default under the [Project Agreement] [Subcontract]. Upon such notice by an Additional Obligee, Surety shall promptly act as if such notice was provided by the Obligee[s] and shall act in accordance with Section 5 of the Bond. Surety shall promptly notify the Obligee[s] of any claims by Additional Obligees relating to this Bond at the address listed in the Bond for the Obligee[s].

Section 4. The aggregate liability of Surety under this Bond, to any or all of the obligees, as their interests may appear, is limited to the Maximum Amount of said Bond.

Section 5. Additional Obligees' rights hereunder are subject to the same defenses Principal and/or Surety have against the Obligee[s].

Section 6. Except as modified herein, the Bond shall be and remains in full force and effect.

[***remainder of page left intentionally blank; signature page follows***]

[47] Refer to footnote on Section 10 of the Bond.
[48] If the Contractor Bond is delivered pursuant to Section 9.3.2.b of the Project Agreement: (i) the Additional Obligees will be the Enterprises and (ii) the Collateral Agent/Lender(s) may also be Additional Obligees as required by the Financing Documents.

IN WITNESS WHEREOF, Principal and Surety have caused this bond to be executed and delivered as of [*date*].

[*To insert signature blocks*.]

Schedule 21
Forms of Supervening Event Notices and Submissions

Instructions

Please generally see Section 15 of the Project Agreement and the italicized and footnoted instructions in the forms that follow.[1] In addition:

(1) Developer shall submit:
- (a) each Supervening Event Notice in the form of Part A to this Schedule 21; and
- (b) each Supervening Event Submission in the form of Part B to this Schedule 21.

(2) Each Supervening Event Notice and each Supervening Event Submission shall relate to an individual Supervening Event, although references can be made (as necessary) to other Supervening Events (e.g. to differentiate the effect of multiple events on the Critical Path).

(3) Bracketed items in Parts A and B to this Schedule 21 include instructions (*in italics*) and drafting alternatives (with multiple options separated by forward slashes "/"). Developer shall modify or delete such bracketed items as the context and any additional instruction notes may require.

(4) Each Supervening Event Notice and each Supervening Event Submission shall include a "SE Tracking Number" in the format of "X.Y" as follows:
- (a) "X" shall be the sequential number of the Supervening Event for which a notice or submission (of any type) is submitted by Developer; and
- (b) "Y" shall be the number of the submission made with respect to a particular Supervening Event, where:
  - (i) "0" shall be reserved to refer to the initial Supervening Event Notice; and
  - (ii) each Supervening Event Submission, including any update or amendment to a previously made submission, shall be numbered in sequence "1", "2", "3" etc.

(5) Developer may attach supporting materials to any Supervening Event Notice or Supervening Event Submission, provided that the relevance and nature of such attachments are described in the main body of the submission.

[1] For certainty, Developer shall delete this instruction box and any instructional footnotes in the relevant form prior to submission.

Part A: Form of Supervening Event Notice

[*on Developer letterhead*]

[*date*]

From: Kiewit Meridiam Partners LLC

To: Enterprise Representative

Re: **Central 70 Project: Supervening Event Notice**

SE Tracking No: **[ ].0**

I am submitting this Supervening Event Notice on behalf of Developer pursuant to Section 15.1.2.a of the Project Agreement for the Central 70 Project (the "Agreement") dated as of November 21, 2017 [(as amended)]. For ease of reference, all capitalized terms used in this notice have the same meaning given to them in the Agreement.

Please be advised of the following:

1. Type of Supervening Event

This notice relates to [a / an]:[2]

- ☐ Force Majeure Event[3] (as defined in paragraph [ ] of the definition of Force Majeure Event)
- ☐ Delay Relief Event[4] (as defined in paragraph a.[ ] of the definition of Relief Event)
- ☐ Relief Event (as defined in paragraph [ ] of the definition of Relief Event)
- ☐ Compensation Event (as defined in paragraph [ ] of the definition of Compensation Event)
- ☐ Appendix B Parcel Unexpected Hazardous Substances Event (which is not a Compensation Event)

2. Occurrence and Duration

The [Force Majeure Event / Delay Relief Event / Relief Event / Compensation Event / Appendix B Parcel Unexpected Hazardous Substances Event (which is not a Compensation Event)] occurred on [or about] [*date*]. This event [concluded on [or about] [*date*] / is continuing].[5]

3. Description

[*Insert narrative description of Supervening Event.*][6]

4. Mitigation

[*Insert narrative description of steps taken, or expected to be taken, by Developer to avoid and/or mitigate the effects of the Supervening Event*.]

5. Next Steps

[*Identify any proposed next steps, such as requests for calls, meetings etc., or otherwise indicate "None proposed at this time."*]

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[2] References to the relevant paragraph within a definition should identify the specific relevant subparagraph.
[3] For a "Force Majeure Event", check both "Force Majeure Event" and "Relief Event".
[4] For a "Delay Relief Event", check "Delay Relief Event" but not "Relief Event".
[5] Developer may modify this statement to account for particular circumstances. In addition, if a Supervening Event is anticipated in advance, replace this form of statement with the following (or the equivalent): "[*Developer*] has determined that a [Force Majeure Event / Delay Relief Event / Relief Event / Compensation Event / Appendix B Parcel Unexpected Hazardous Substances Event (which is not a Compensation Event)] is [likely imminent]. Developer first made this determination on [or about] [*date*] based on [*explanation*]."
[6] The narrative description should, to the extent reasonably possible and in addition to any other information that Developer deems relevant, describe or identify: (a) the event; (b) such event's source/origin/cause; (c) affected location(s); and (d) such event's anticipated or actual effect on the Work.

By: _____

[*insert name*]
Developer's Representative

Part B: Form of Supervening Event Submission

[*on Developer letterhead*]

[*date*]

From: Kiewit Meridiam Partners LLC

To: Enterprise Representative

Re: **Central 70 Project: [Preliminary / Detailed] Supervening Event Submission**

SE Tracking No: **[ ].[ ]**

I am submitting this [Preliminary / Detailed] Supervening Event Submission on behalf of Developer pursuant to Section 15.1.2.b of the Project Agreement for the Central 70 Project (the "Agreement") dated as of November 21, 2017 [(as amended)]. For ease of reference, all capitalized terms used in this submission shall have the same meaning given to them in the Agreement.

Please be advised of the following[7]:

A. Background Information

1. Type of Supervening Event

This submission relates to [a / an]:[8]

- ☐ Force Majeure Event[9] (as defined in paragraph [ ] of the definition of Force Majeure Event)
- ☐ Delay Relief Event[10] (as defined in paragraph a.[ ] of the definition of Relief Event)
- ☐ Relief Event (as defined in paragraph [ ] of the definition of Relief Event)
- ☐ Compensation Event (as defined in paragraph [ ] of the definition of Compensation Event)
- ☐ Appendix B Parcel Unexpected Hazardous Substances Event (which is not a Compensation Event)

2. Occurrence and Duration

The [Force Majeure Event / Delay Relief Event / Relief Event / Compensation Event / Appendix B Parcel Unexpected Hazardous Substances Event (which is not a Compensation Event)] occurred on [or about] [*date*]. This event [concluded on [or about] [*date*] / is continuing].[11]

3. Description

[*Insert narrative description of Supervening Event.*][12]

4. Mitigation

[*Insert narrative description of steps taken, or expected to be taken, by Developer to avoid and/or mitigate the effects of the Supervening Event.*]

---

[7] In each Detailed Supervening Event Submission, and in any revised or amended Supervening Event Submission, Developer shall include the following statement immediately under the relevant headings below and prior to any narrative text inserted by Developer relating to the specific Supervening Event: "The following [has / has not] been amended since the prior related submission no. [X].[X]."

[8] References to the relevant paragraph within a definition should identify the specific relevant subparagraph, if applicable.

[9] For a "Force Majeure Event", check both "Force Majeure Event" and "Relief Event".

[10] For a "Delay Relief Event", check "Delay Relief Event" but not "Relief Event".

[11] Developer may modify this statement to account for particular circumstances.

[12] The narrative description should, to the extent reasonably possible and in addition to any other information that Developer deems relevant (and that is not required to be provided in a separate part of this form), describe or identify: (a) the event; (b) such event's source/origin/cause; and (c) affected location(s).

B. Developer's Request[13]

5. Requested Resolution

[*Insert summary description of relief, deadline extension and/or compensation sought with specific references to: (a) each relevant sub-Section within Sections 15.3, 15.6 and 15.7; and (b) the detailed supporting analysis below*.]

6. Compliance Analysis

[*Insert analysis of the Supervening Event's effect (if any) on Developer's performance of its obligations.*][14]

7. Time Impact Analysis[15]

[*Insert a time impact analysis*[16] *of the effect (if any) of the Supervening Event on the Critical Path or, with respect to any such event affecting completion of a Payment Milestone, on the expected time for completion of such Payment Milestone*.][17]

8. Change in Costs and Financing Costs

[*Insert good faith estimate of compensable Change in Costs*[18]*, Milestone Payment Delay Costs and/or Delay Financing Costs, if any, together with the methodology for calculating such estimate in accordance with the terms of the Agreement*.][19]

C. Supporting Information

9. Documentation and Communications

[*Insert description of (and, if appropriate, attach) all materially relevant available documentation and / or communications, if any, related to the Supervening Event*, *or otherwise indicate "None."*]

10. Additional Information

[*Insert any additional information Developer believes is relevant to the Enterprises' consideration of the Supervening Event, and / or which the Enterprises have previously requested in connection with such event*, *or otherwise indicate "None."*]

Under penalty of perjury, the undersigned certifies on behalf of Developer that, to the best of Developer's knowledge (after due inquiry), the requests, claims, representations, statements, disclosures and

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[13] Completion of B. is optional in a Preliminary Supervening Event Submission.

[14] Identify any actual or potential Noncompliance Events and/or Closures that were, or are expected to be, directly attributable to the occurrence of such Supervening Event absent relief pursuant to Section 15 of the Project Agreement.

[15] Indicate "Not applicable." for any Supervening Event to the extent occurring after Final Acceptance.

[16] This analysis should be made by reference to a Revised Baseline Schedule (or, in the case of a Preliminary Supervening Event Submission, the then current Project Schedule to the extent that a Revised Baseline Schedule reflecting the impact of the relevant Supervening Event is not yet available) and should:

(a) include a fragmentary network demonstrating how Developer proposes to incorporate the relevant delay into the Revised Baseline Schedule and the next monthly Progress Schedule;
(b) demonstrate the time impact to each and every affected Activity;
(c) reflect the details of the Supervening Event, including any added, changed or deleted data for Activities and logic; and
(d) include a printed Gantt chart (together with an electronic version) including all impacted Activities, grouped and sorted by WBS and compared to the then current Revised Baseline Schedule and most recent monthly Progress Schedule.

[17] The analysis should, to the extent applicable:
(a) identify the impact on the achievement of Milestone Completion of any Payment Milestone and, given such impact, the basis for determining the resulting period of delay in achieving such Milestone Completion; and
(b) identify the impact on the anticipated actual Substantial Completion Date or, if the Substantial Completion Date has already occurred, the Final Acceptance Date and, given such impact, the basis for determining the requested extension to the Baseline Substantial Completion Date, the Longstop Date or the Final Acceptance Deadline Date (as applicable).

[18] Which, for certainty, may be calculated as applicable pursuant to paragraphs a., b. or c. of the definition thereof in Part A of Annex A (*Definitions and Abbreviations*) of the Project Agreement.

[19] This should include: (a) information as to the type and amount of Available Insurance; (b) consideration of applicable deductions (pursuant to Section 15.3.1.e of the Project Agreement) and compensation exclusions (pursuant to Section 15.7 of the Project Agreement); and (c) reference to accompanying supporting documentation (which is required for a Detailed Supervening Event Submission and optional for a Preliminary Supervening Event Submission).

information contained in this Supervening Event Submission are correct, complete (other than as expressly indicated herein) and not materially misleading.

By: _____

[*insert name*]
Developer's Representative

Schedule 22
Forms of Legal Opinions

Part A: Form of Enterprises' Legal Opinion

Ladies and Gentlemen:

We have served, in a limited role, as advisory counsel (but not as bond counsel or disclosure counsel) to the Colorado High Performance Transportation Enterprise ("HPTE") and the Colorado Bridge Enterprise ("BE" and, together with HPTE, the "Enterprises", and each, an "Enterprise") in connection with the execution and delivery of the Project Agreement for the Central 70 Project, dated as of November 21, 2017 (the "Project Agreement"), between the Enterprises and Kiewit Meridiam Partners LLC, a limited liability company formed under the laws of the State of Delaware (the "Developer"), the other Enterprise Closing Agreements (as defined in the Project Agreement), and the Interagency Agreement, dated as of [ ], by and among the Enterprises and the Colorado Department of Transportation for the Central 70 Project (the "IAA"). Capitalized terms used but not defined in this Opinion Letter shall have the meanings given to them in Part A of Annex A (*Definitions and Abbreviations*) of the Project Agreement.

In this connection we have examined: (1) the Project Agreement; (2) the Project Agreement Amendment dated as of [ ] between the Enterprises and the Developer; (3) the Lenders Direct Agreement dated as of [ ] between the Enterprises and [ ], a [ ]; (4) each Principal Subcontractor Direct Agreement[1]; (5) the IAA; (6) the 2017 Supplemental Trust Indenture, dated as of [ ], between BE and Zions Bank, a division of ZB, National Association (the "Trustee") (the "Supplemental Indenture"); (7) the Master Trust Indenture, dated as of December 15, 2010, between BE and the Trustee as successor trustee to Wells Fargo Bank, N.A. (as amended, including by the Supplemental Indenture, the "Master Indenture"); (8) the Central 70 Note; and (9) each other Enterprise Closing Agreement[2]. The documents referred to in (1) through (9), together, are referred to in this Opinion Letter as the "Enterprise Opinion Documents".

We have also examined originals or copies, certified or otherwise identified to our satisfaction, of such other documents, public records and other instruments and have conducted such other investigations as we have deemed necessary for the purposes of this Opinion Letter. As to questions of fact material to our Opinion Letter, we have relied upon such certified proceedings and certifications of public officials furnished to us, without undertaking to verify the same by independent investigation.

We have relied on the representations of Developer contained in the Project Agreement.

We have assumed that:

(i) Developer has complied with all legal requirements pertaining to its status as such status relates to its right to enforce and comply with the Enterprise Opinion Documents against, as applicable, the Enterprises, the Lenders and any other parties thereto;

(ii) each Enterprise Opinion Document submitted to us for review is accurate and complete, each such document that is an original is authentic, each such document that is a copy conforms to an authentic original, and all signatures on each such document are genuine; and

(iii) the form and content of all Enterprise Opinion Documents submitted to us as unexecuted final drafts do not differ in any respect relevant to this Opinion Letter from the form and content of such Enterprise Opinion Documents as executed and delivered.

Whenever an opinion expressed herein is stated to be to our knowledge (or other words of similar import are used), it means, without (except to the extent expressly set forth therein) investigation, analysis, or review of court or other public records or our files, or inquiry of persons, the conscious awareness of facts

[1] Parties and dates of execution to be added in respect of each Principal Subcontractor Direct Agreement in the delivered opinion.
[2] Parties and dates of execution to be added in respect of any additional Enterprise Closing Agreements in the delivered opinion.

or other information by the lawyers within the Colorado Attorney General's Office who have had active involvement in negotiating, preparing, and reviewing the Enterprise Opinion Documents.

All opinions expressed herein regarding compliance with law are limited to the laws of the State of Colorado (and, with respect to the opinion specified in paragraph 8 only, the Federal laws expressly referenced therein), in each case, as in effect on the date of this Opinion Letter.

Our opinion with respect to the Master Trust Indenture as an Enterprise Opinion Document is limited to those opinions expressed in paragraphs 4, 5, 7 and 8.

We are of the opinion that:

1. Each Enterprise is a government-owned business within CDOT and an enterprise within the meaning of Article X, Section 20(2)(d) of the Colorado Constitution, duly created, organized and existing under the laws of the State, and specifically Part 8 of Article 4 of Title 43 of the Colorado Revised Statutes.

2. Each Enterprise has the legal power, right and authority to execute, deliver and perform its obligations, as such separately apply to each Enterprise, under the Enterprise Opinion Documents to which it is a party.

3. Each Enterprise has duly authorized by all necessary action the execution, delivery and performance of its obligations, as such separately apply to each Enterprise, under, and has duly and validly executed and delivered, the Enterprise Opinion Documents to which it is a party.

4. Each Enterprise Opinion Document constitutes a legal, valid and binding obligation of each Enterprise party thereto, enforceable against each such Enterprise, as such separately apply to each Enterprise, in accordance with its terms, except to the extent limited by applicable bankruptcy, insolvency, reorganization, moratorium or other similar laws affecting the enforceability of the rights of creditors generally, by general principles of equity, by the exercise by the State and its governmental bodies of the police power inherent in the sovereignty of the State and by the exercise by the United States of the powers delegated to it by the Constitution of the United States.

5. [Except as otherwise disclosed in writing by the Enterprises to Developer (a copy of which disclosure is attached to this Opinion Letter),][3] no action, suit, proceeding, investigation or litigation is pending or, to the best of our knowledge, overtly threatened in writing, that (a) challenges: (i) the creation, organization or existence of either Enterprise; (ii) the power, right or authority of either Enterprise to execute, deliver or perform its obligations under any of the Enterprise Opinion Documents to which it is a party; (iii) the legality, validity or enforceability of any of the Enterprise Opinion Documents as against either Enterprise, as applicable; or (iv) the authority of any representative of either Enterprise executing any of the Enterprise Opinion Documents; or (b) could reasonably be expected to materially and adversely affect the ability of any Enterprise to perform its obligations under any Enterprise Opinion Document.

6. [Except as otherwise disclosed in writing by the Enterprises to Developer (a copy of which disclosure is attached to this Opinion Letter),][4] all required consents and approvals have been obtained with respect to the execution and delivery by each Enterprise of, and performance by such Enterprise of its obligations under, the Enterprise Opinion Documents to which it is a party.

7. The execution and delivery of the Enterprise Opinion Documents has not resulted in, and will not result in, and the performance thereof and the consummation of the transactions contemplated thereby has not resulted in, and will not result in, a breach of, default under or violation of any other agreement, judgment, decree or instrument, in each case to which any Enterprise is a party or by which it is bound and of which we are aware.

[3] To be included only in connection with any Financial Close that occurs, pursuant to Schedule 1, notwithstanding the occurrence of any Key Financial Event of a type referred to in paragraphs d., e. or f. of the definition thereof in Annex A (Definitions and Abbreviations) of the Project Agreement

[4] See prior note.

8. The execution and delivery by each Enterprise of the Enterprise Opinion Documents to which it is a party has not resulted in, and will not result in, and the performance thereof by each such Enterprise and the consummation of the transactions contemplated thereby has not resulted in, and will not result in, any conflict with or violation of either (a) any law of the State of Colorado applicable to it or (b) all applicable requirements of the National Environmental Policy Act of 1969, as amended,[5] the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (42 U.S.C. § 4601 *et seq*.), and Title VI of the Civil Rights Act of 1964 (42 U.S.C. § 2000d *et seq*.); provided, however, that no opinion is given as to whether the Enterprise Opinion Documents comply with or are excepted from the provisions of Sections 24-91-101 through 24-91-110 and Sections 38-26-106 through 38-26-109 of the Colorado Revised Statutes.

FOR THE ATTORNEY GENERAL OF THE STATE OF COLORADO

Office of the Attorney General

[5] Inclusion of reference to NEPA subject to qualification in connection with related litigation.

Part B: Form of CDOT Legal Opinion

Ladies and Gentlemen:

We have served, in a limited role, as advisory counsel (but not as bond counsel or disclosure counsel) to the Colorado Department of Transportation ("CDOT") in connection with the execution and delivery of the Interagency Agreement, dated as of [ ], by and among the Colorado High Performance Transportation Enterprise ("HPTE"), the Colorado Bridge Enterprise ("BE" and, together with HPTE, the "Enterprises") and CDOT for the Central 70 Project (the "IAA"). Capitalized terms used but not defined in this Opinion Letter shall have the meanings given to them in Part A of Annex A (*Definitions and Abbreviations*) of the Project Agreement for the Central 70 Project, dated as of November 21, 2017 (the "Project Agreement"), between the Enterprises and Kiewit Meridiam Partners LLC, a limited liability company formed under the laws of the State of Delaware (the "Developer").

In addition to examining the IAA, we have examined originals or copies, certified or otherwise identified to our satisfaction, of such other documents, public records and other instruments and have conducted such other investigations as we have deemed necessary for the purposes of this Opinion Letter. As to questions of fact material to our Opinion Letter, we have relied upon such certified proceedings and certifications of public officials furnished to us, without undertaking to verify the same by independent investigation.

We have relied on the representations of Developer contained in the Project Agreement.

We have assumed that:

(i) the IAA submitted to us for review is accurate and complete, such document that is an original is authentic, such document that is a copy conforms to an authentic original, and all signatures on such document are genuine; and

(ii) the form and content of the IAA submitted to us as an unexecuted final draft does not differ in any respect relevant to this Opinion Letter from the form and content of the IAA as executed and delivered.

Whenever an opinion expressed herein is stated to be to our knowledge (or other words of similar import are used), it means, without (except to the extent expressly set forth therein) investigation, analysis, or review of court or other public records or our files, or inquiry of persons, the conscious awareness of facts or other information by the lawyers within the Colorado Attorney General's Office who have had active involvement in negotiating and preparing the IAA.

All opinions expressed herein regarding compliance with law are limited to the laws of the State of Colorado, in each case, as in effect on the date of this Opinion Letter.

We are of the opinion that:

1. CDOT is an agency of the State and has the legal power, right and authority to execute, deliver and perform its obligations under the IAA, subject to the terms and conditions of such document.

2. CDOT has duly authorized by all necessary action the execution, delivery and performance of its obligations under, and has duly and validly executed and delivered, the IAA.

3. The IAA constitutes legal, valid and binding obligations of CDOT, enforceable against it in accordance with its terms, except to the extent limited by applicable bankruptcy, insolvency, reorganization, moratorium or other similar laws affecting the enforceability of the rights of creditors generally, by general principles of equity, by the exercise by the State and its governmental bodies of the police power inherent in the sovereignty of the State and by the exercise by the United States of the powers delegated to it by the Constitution of the United States.

4. [Except as otherwise disclosed in writing by the Enterprises to Developer (a copy of which disclosure is attached to this Opinion Letter),][6] no action, suit, proceeding, investigation or litigation is pending or, to the best of our knowledge, overtly threatened in writing, that (a) challenges: (i) the creation, organization or existence of CDOT; (ii) the power, right or authority of CDOT to execute, deliver or perform its obligations under the IAA; (iii) the legality, validity or enforceability of the IAA as against CDOT; or (iv) the authority of any representative of CDOT executing the IAA; or (b) could reasonably be expected to materially and adversely affect the ability of CDOT to perform its obligations under the IAA.

5. [Except as disclosed in writing by CDOT to Developer (a copy of which disclosure is attached to this Opinion Letter),][7] all required consents and approvals have been obtained with respect to the execution and delivery by CDOT of, and the performance by CDOT of its obligations under, the IAA.

6. The execution and delivery of the IAA has not resulted in, and will not result in, and the performance thereof and the consummation of the transactions contemplated thereby has not resulted in, and will not result in, a breach of, default under or violation of any other agreement, judgment, decree or instrument, in each case to which CDOT is a party or by which it is bound and of which we are aware.

7. The execution and delivery by CDOT of the IAA has not resulted in, and will not result in, and the performance thereof by CDOT and the consummation of the transactions contemplated thereby has not resulted in, and will not result in, any conflict with or violation of any law of the State of Colorado applicable to CDOT.

FOR THE ATTORNEY GENERAL OF THE STATE OF COLORADO

Office of the Attorney General

[6] See prior note.
[7] See prior note.

Part C: Form of Developer Legal Opinion

Developer shall provide the following opinions pursuant to Section 2.2(e) of Schedule 1 (*Financial Close*) with respect to Developer, each Principal Subcontractor and any Guarantor (each, an "Opinion Party")[8] and, to the extent applicable to each such Opinion Party, each of the documents listed in Annex A to this Part C of this Schedule 22 (the "Opinion Documents").

With respect to Developer as an Opinion Party, each opinion shall be given by external and not internal counsel. With respect to each other Opinion Party, each opinion may be given by either internal or external counsel (or a combination of both): (a) except that the opinions specified in paragraphs 4 and 8 below shall be required to be given by external counsel, unless, (i) with respect to any Guarantor incorporated outside of the United States, the Lenders approve of such opinions being given by internal counsel or (ii) the Enterprises consent (such consent not to be unreasonably withheld) to such opinions being given by internal counsel; and (b) subject to the Enterprises' right to require delivery of an opinion of external counsel to the extent Lenders shall receive the same or an equivalent opinion from external counsel in connection with Financial Close.

1. Opinion regarding organization or formation and existence of each Opinion Party and each Opinion Party's possession of the corporate or organizational power to own its properties and assets, carry on its business, enter into and perform its obligations under the Opinion Documents to which it is a party.

2. Opinion regarding Developer's and each Principal Subcontractor's good standing and qualification to do business in the State of Colorado.

3. Opinion that each of the Opinion Documents to which any Opinion Party is a party has been duly authorized by all necessary corporate action on the part of such Opinion Party and that each of the Opinion Documents to which such Opinion Party is a party has been duly executed and delivered by such Opinion Party.

4. Opinion that each of the Opinion Documents to which any Opinion Party is a party constitutes a legal, valid and binding obligation of such Opinion Party enforceable against such Opinion Party in accordance with its terms.

5. Opinion that there is no action, suit, proceeding, investigation or litigation pending and served on any Opinion Party, or overtly threatened in writing against any Opinion Party, which challenges such Opinion Party's authority to execute, deliver or perform, or the legality, validity or enforceability of any of the Opinion Documents to which it is a party, or which challenges the authority of such Opinion Party's representative executing any of the Opinion Documents to which it is a party.

6. Opinion that all required consents and approvals have been obtained with respect to execution, delivery and performance by each Opinion Party of each of the Opinion Documents to which it is a party, and that none of the Opinion Documents to which any such Opinion Party is a party conflicts with any other agreements to which such Opinion Party is a party or with any orders, judgments or decrees by which such Opinion Party is bound.

7. Opinion that execution, delivery and performance of all obligations by each Opinion Party under each of the Opinion Documents to which it is a party do not conflict with, and are authorized by, the organizational or formation documents of such Opinion Party.

8. Opinion that execution and delivery by each Opinion Party of the Opinion Documents to which it is a party does not, and such Opinion Party's performance of its obligations under the Opinion Documents to which it is a party shall not, violate any statue, rule or regulation applicable to such Opinion Party or to transactions of the type contemplated by any of the Opinion Documents to which such Opinion Party is a party.

[8] The following opinions shall be modified, in the Enterprises' reasonable discretion, as necessary in the event that any Opinion Obligor is a joint venture or partnership.

Annex A

Opinion Documents

1. With respect to Developer as an Opinion Party:
   (a) Project Agreement;
   (b) Project Agreement Amendment;
   (c) Lenders' Direct Agreement;
   (d) each Principal Subcontract;
   (e) each Principal Subcontractor Direct Agreement; and
   (f) Financial Model Escrow Agreement.
2. With respect to each Principal Subcontractor as an Opinion Party, the applicable:
   (a) Principal Subcontract; and
   (b) Principal Subcontractor Direct Agreement.
3. With respect to any Guarantor as an Opinion Party, the applicable:
   (a) Guarantee; and
   (b) Principal Subcontractor Direct Agreement.

Schedule 23
Form of Financial Model Escrow Agreement

This Escrow Agreement (this "Agreement") is dated as of [ ] and made among:

(1) Colorado High Performance Transportation Enterprise ("HPTE"), a government-owned business within, and a division of, the Colorado Department of Transportation ("CDOT");

(2) Colorado Bridge Enterprise, a government-owned business within CDOT ("BE" and, together with HPTE, each individually an "Enterprise" and, together, the "Enterprises");

(3) Kiewit Meridiam Partners LLC, a limited liability company formed under the laws of the State of Delaware ("Developer"); and

(4) [ ] as escrow agent (the "Escrow Agent").

RECITALS

Whereas:

(A) Simultaneously with the execution of this Agreement, the Enterprises and Developer have entered into a Project Agreement for the Central 70 Project dated as of November 21, 2017 (as the same may be amended, modified or supplemented from time to time in accordance with its terms, the "Project Agreement"), in connection with the design, construction, financing, operation and maintenance of a portion of the I-70 East corridor in Greater Denver (the "Project") as more fully described in the Project Agreement.

(B) It is a condition precedent to the execution of the Project Agreement that the parties hereto execute this Agreement.

Now, therefore, in consideration of the mutual covenants and agreements described below and other good and valuable consideration, the receipt and adequacy of which are hereby acknowledged, the parties hereto hereby agree as follows:

1. DEFINITIONS AND INTERPRETATION

1.1 Definitions

Capitalized terms used but not defined in this Agreement shall have the meanings given to them in Part A of Annex A (*Definitions and Abbreviations*) of the Project Agreement.

1.2 Interpretation

(a) Headings and other internal references

(i) Headings are inserted for convenience only and shall not affect interpretation of this Agreement.

(ii) Except as the context may otherwise provide, the words "herein", "hereof" and "hereunder", and words of similar import, shall be construed to refer to this Agreement in its entirety and not to any particular provision of it.

(iii) Except as otherwise expressly provided or as the context may otherwise provide, a reference to any Section within this Agreement is a reference to such Section of this Agreement.

(b) Common terms and references

(i) The singular includes the plural and vice versa.

(ii) Words preceding "include", "includes", "including" and "included" shall be construed without limitation by the words that follow.

(iii) The word "promptly" means as soon as reasonably practicable in light of then-prevailing circumstances.

(c) References to agreements, documents and Persons

Except as otherwise expressly provided in this Agreement, a reference:

(i) to an agreement or other document shall be construed to be a reference to such agreement or other document (including any schedules, annexes or exhibits thereto) as it may be amended, modified or supplemented from time to time in accordance with its terms; and

(ii) to a Person includes such Person's permitted successors, assigns and transferees.

2. DEPOSIT

2.1 Initial Deposit

(a) Developer hereby deposits with the Escrow Agent:

(i) an unrestricted electronic version of the Base Financial Model;

(ii) the "Assumptions Book" submitted by the Preferred Proposer pursuant to Section 6.10.2 of the "Financial Proposal Submission Requirements" in the ITP; and

(iii) the audit report submitted by the Preferred Proposer pursuant to Section 6.10.3 of the "Financial Proposal Submission Requirements" in the ITP,

((i) through (iii), together with any supplements or amendments thereto or replacements thereof, the "Escrow Documents").

(b) The Escrow Agent hereby acknowledges receipt of the Escrow Documents specified in Sections 2.1(a)(i) through (iii), and agrees that such Escrow Documents shall be held in escrow pursuant to this Agreement.

2.2 Supplements, Amendments and Replacements

The Escrow Agent agrees to accept and hold in escrow pursuant to this Agreement any supplements, amendments or replacements to the Escrow Documents jointly delivered to it by Developer and the Enterprises from time to time.

3. ESCROW DOCUMENTS

3.1 Holding of Escrow Documents

(a) The Escrow Agent shall hold the Escrow Documents in escrow in a designated area on the premises located at [ ][1], or at such other equivalent location in the State as may be approved in writing by the Enterprises (acting reasonably), on a confidential and secure basis. Such designated area shall be locked at all times when such documents are not otherwise being accessed pursuant to this Agreement.

(b) The Escrow Agent shall provide the Enterprises and Developer with joint access to the Escrow Documents at the designated location during Working Days subject to at least two Working Days' prior notice. Furthermore, with notice to Developer at least five Working Days in advance, the Enterprises shall be entitled to access (but not supplement, amend or replace) the Escrow Documents. Developer, but not the Enterprises, shall be deemed to waive its joint access right.

(c) Other than each Party's professional advisors and consultants (which may accompany such Party when, or act on behalf of such Party for the purpose of, accessing the Escrow Documents), no third party, including the employees of the Escrow Agent, shall be allowed access to any of the Escrow Documents, provided that employees of the Escrow Agent shall have access to the designated area for other necessary purposes subject to

[1] Location must be in Colorado.

prior notice to the Enterprises and Developer of the policies and procedures governing such access.

3.2 Release of Escrow Documents

The Escrow Agent shall release the applicable Escrow Documents to either of the Enterprises or Developer upon delivery of joint instructions to the Escrow Agent by the Enterprises and Developer.

4. REPRESENTATION AND WARRANTY

As of the date of this Agreement and as of each date the Enterprises and Developer deposit with the Escrow Agent a supplement, amendment or replacement to or of any Escrow Document, Developer represents and warrants to the Escrow Agent and the Enterprises that:

(a) it lawfully possesses each such Escrow Document provided to the Escrow Agent;

(b) no agreements, liens or encumbrances prohibit, limit, or alter the rights and obligations of the Enterprises or the Escrow Agent under this Agreement;

(c) it possesses all rights necessary with respect to each such Escrow Document to permit the Escrow Agent to perform its obligations, and the Enterprises to exercise their rights, under this Agreement in accordance with the terms hereof;

(d) each such Escrow Document is readable and useable in its then current form and, if any portion of any such Escrow Document is encrypted, the necessary decryption tools and keys to read such material have been deposited with the Escrow Agent contemporaneously; and

(e) such Escrow Documents (together with any such documents already in escrow) constitute a complete and correct set of the Escrow Documents required to be deposited pursuant to Sections 2.1 and 2.2.

5. TERM AND TERMINATION

(a) This Agreement shall continue in full force and effect until the earlier of the Expiry Date and the date on which Developer and the Enterprises provide the Escrow Agent with joint notice of their intent to terminate this Agreement.

(b) Upon termination of this Agreement, the Escrow Agent shall promptly return the Escrow Documents to Developer.

6. RIGHTS OF ESCROW AGENT

(a) If conflicting demands are made or notices served upon the Escrow Agent with respect to this escrow, the parties hereto expressly agree that the Escrow Agent shall have the absolute right at its election to do any of the following:

(i) suspend access to the Escrowed Documents;

(ii) file a suit in interpleader and obtain an order from the court requiring the parties to interplead and litigate in such court their several claims and rights amongst themselves;

(iii) deliver all Escrow Documents with seals intact to another location to be selected by the Enterprises within 30 days after the Escrow Agent delivers notice thereof to Developer and the Enterprises.

(b) Notwithstanding Section 6(a), after the Enterprises deliver to the Escrow Agent a notice that a Developer Default has occurred and is continuing (and until such notice is withdrawn by a subsequent notice from the Enterprises to the Escrow Agent), the Escrow Agent shall accept instructions pursuant to this Agreement solely from the Enterprises, including with respect to matters that otherwise would require joint action or instruction pursuant to this Agreement.

7. GENERAL PROVISIONS

7.1 Fees and expenses

(a) Developer shall be responsible for all fees and expenses of the Escrow Agent in connection with this Agreement.

(b) Except as otherwise expressly provided in Section 7.1(a) or, as between the Enterprises and Developer, pursuant to the Project Agreement, each party shall bear its own costs and expenses (including legal and other advisers' fees and expenses) in connection with the preparation, negotiation, execution and performance of this Agreement.

7.2 Choice of Law

This Agreement shall be governed by and construed in accordance with the laws of the State of Colorado, other than any provision thereof that permits or requires the application of the laws of another jurisdiction, and regardless of any other jurisdiction's choice of law rules. Any provision incorporated herein by reference which purports to negate this provision, in whole or in part, shall not be valid or enforceable or available in any action at law, whether by way of complaint, defense, or otherwise. Any provision rendered null and void by the operation of this provision shall not invalidate the remainder of this Agreement, to the extent capable of execution.

7.3 Jurisdiction and Venue

All suits or actions related to this Agreement shall be filed and proceedings held in the State and exclusive venue shall be in State or Federal court in the City of Denver, and each party hereto irrevocably waives:

(a) any objection which it may have at any time to the laying of venue of any such suit, action or proceeding brought in any such court;

(b) any claim that any such suit, action or proceeding has been brought in an inconvenient forum; and

(c) the right to object that such court does not have any jurisdiction with respect to such suit, action or proceeding.

7.4 Amendments and Waivers

(a) This Agreement may only be amended by a written amendment duly executed by all parties' designees, unless the amendment to this Agreement is expressly allowed or required to be made in any other manner pursuant to this Agreement and Law.

(b) Except to the extent otherwise expressly provided in this Agreement:

(i) any waiver of, or consent to depart from, the requirements of any provision of this Agreement shall be approved in the discretion of the party giving it and shall be effective only if it is in writing by such party, and only in the specific instance, for the specific time, subject to the specific conditions and for the specific purpose for which it has been given;

(ii) no failure on the part of any party to exercise, and no delay in exercising, any right or power under this Agreement shall operate as a waiver of such right or power; and

(iii) no single or partial exercise of any right or power under this Agreement, including any right to give or withhold any consent or approval, nor any abandonment or discontinuance of steps to enforce such a right or power, shall preclude or render unnecessary any other or further exercise of such right or the exercise of any other right.

7.5 Successors and Assigns

(a) Except to the extent expressly provided hereunder, no party to this Agreement may assign or transfer any part of its rights or obligations hereunder without the prior written consent of the other parties.

(b) This Agreement shall be binding upon and inure to the benefit of the parties hereto and their respective successors and permitted assigns.

7.6 Severability

(a) If any provision (or part of any provision) of this Agreement is ruled invalid by a court having proper jurisdiction, then the parties shall:

(i) promptly meet and negotiate a substitute for such provision or part thereof which shall, to the greatest extent legally permissible, effect the original intent of the parties; and

(ii) if necessary or desirable, apply to the court which declared such invalidity for an interpretation of the invalidated provision (or part thereof) to guide the negotiations.

(b) If any provision (or part of any provision) of this Agreement shall, for any reason, be held to be invalid, illegal, or unenforceable in any respect, such provision (or part thereof) shall not affect the validity, legality and enforceability of any other provision of (or the other part of such provision) or any other documents referred to in this Agreement, and this Agreement shall be construed as if such invalid, illegal, or unenforceable provision (or part thereof) had never been contained herein.

7.7 Entire Agreement

This Agreement constitutes the entire agreement among the Enterprises, Developer and the Escrow Agent concerning the subject matter hereof and supersedes all prior negotiations, representations, and agreements, either oral or written, among the parties with respect to their subject matter.

7.8 Notices and Communications

(a) Any notice shall be given in writing by means of physical, digital or electronic communication, but excluding the use of social media, messengering, broadcast and equivalent services, to the relevant party at the following addresses, as applicable:

Enterprises

HPTE	BE	Copy to
David I. Spector HPTE Director 4201 E. Arkansas Ave. Denver, CO 80222 (303) 757-9607 david.spector@state.co.us	Joshua Laipply, P.E. Chief Engineer 4201 E. Arkansas Ave. Denver, CO 80222 (303) 757-9204 joshua.laipply@state.co.us	Brent Butzin Assistant Attorney General Transportation Unit Ralph L. Carr Colorado Judicial Center 1300 Broadway, 10th Floor Denver, CO 80203 (720) 508-6638 Brent.Butzin@coag.gov

Developer	**Escrow Agent**
[*Attention*] Kiewit Meridiam Partners LLC 160 Inverness Drive West, Suite 110 Englewood, Colorado 80112 [*Phone*] [*Email*]	[*Attention*] [*Address*] [*Phone*] [*Email*]

(b) A notice shall be deemed to have been submitted:

(i) upon receipt (confirmed by automatic answer back, read receipt or equivalent evidence of receipt), if validly transmitted by digital or electronic distribution before 3:00 p.m. (local time at the place of receipt) on a Working Day;

(ii) on the next Working Day following receipt (confirmed by automatic answer back, read receipt or equivalent evidence of receipt), if validly transmitted by digital or electronic distribution on or after 3:00 p.m. (local time at the place of receipt) on a Working Day;

(iii) upon receipt, if physically delivered in person or by courier; or

(iv) if delivered by courier or postage pre-paid certified or registered mail, on the date of receipt as shown by the addressee's registry or certification receipt or on the date receipt at the appropriate address is refused, as shown on the records or manifest of the United States Postal Service or independent courier.

(c) The parties will notify each other in writing of any change of address and/or contact information, such notification to become effective five Working Days after notification.

7.9 Counterparts

This Agreement (or an amendment or waiver in respect to this Agreement) may be executed in one or more counterparts (including by electronic signature and/or scanned or digital transmission). Any single counterpart or a set of counterparts executed, in either case, by each of the parties shall constitute a full and original instrument for all purposes.

7.10 No Third Party Beneficiaries

It is not intended by any of the provisions of this Agreement to create any third party beneficiary rights hereunder. Notwithstanding the foregoing, the duties, obligations and responsibilities of the parties with respect to third parties shall remain as imposed by Law.

7.11 No Partnership

Nothing in this Agreement is intended or shall be construed to create any partnership, joint venture or similar relationship or among the parties. None of the parties shall hold itself out contrary to this Section 7.11.

7.12 No Personal Liability

Each Enterprise's authorized representatives, including the Enterprise Representative, are acting solely as agents and representatives of the Enterprises when carrying out the provisions of or exercising the power or authority granted to them under this Agreement, and, as such, none of them shall not be liable either personally or as employees of the Enterprises for actions in their ordinary course of employment.

[remainder of page left intentionally blank; signature page follows]

IN WITNESS WHEREOF, the parties hereto, each intending to be legally bound by this writing, have caused this Agreement to be executed the date first above written.

[*To insert signature blocks*.]

Schedule 24
Change Procedure

1. ENTERPRISE CHANGES AND DIRECTIVE LETTERS

1.1. Delivery of and Response to Enterprise Change Notices

a. The Enterprises shall be entitled to (and, when required to do so pursuant to Section 8.6.2.b of the Project Agreement, shall) submit Enterprise Change Notices to Developer pursuant to Section 14.1.a of the Project Agreement.

b. Any Enterprise Change Notice:

i. shall:

A. set out the Enterprises' requirements for the relevant Enterprise Change in reasonably sufficient detail to enable Developer to prepare and timely submit a Developer's Enterprise Change Response; and

B. include any specific directions or requirements as to the contents of the Developer's Enterprise Change Response (which may be in addition to the content requirements specified in Sections 1.1.c.i.A through K of this Schedule 24, or to the effect that any such content requirement is not relevant to the proposed Enterprise Change); and

ii. may, in the Enterprises' discretion, require the Developer to:

A. participate in a preliminary meeting regarding the proposed Enterprise Change at such time and location as the Enterprises may reasonably request; and

B. at or before such preliminary meeting, deliver to the Enterprises a written preliminary, non-binding order of magnitude cost estimate for the proposed Enterprise Change which shall be prepared by Developer on a Reasonable Efforts basis and shall include each of the following elements (or a statement to the effect that such element is not relevant to the proposed Enterprise Change):

I. an introductory summary of the contents of such response;

II. a preliminary scope of work for such Enterprise Change, together with:

a. a preliminary schedule for implementation of such scope of work; and

b. identification of any adjustments to the Baseline Schedule anticipated to be required to implement such Enterprise Change;

III. a preliminary analysis of any extension of time and/or relief to which Developer may be entitled pursuant to Section 15 of the Project Agreement as a result of such Enterprise Change, including a preliminary time impact analysis (made by reference to the Revised Baseline Schedule subject to adjustment as indicated by Developer pursuant to Section 1.1.b.ii.B.II.b of this Schedule 24, and otherwise that complies with the requirements for such an analysis set out in relation to paragraph B.7 of Part B of Schedule 21 (*Forms of Supervening Event Notices and Submissions*)) of the effect (if any) of such Enterprise Change on achievement of any Key Milestone;

IV. a preliminary estimate of any Change in Costs, Delay Financing Costs and/or Milestone Payment Delay Costs to which

Developer may be entitled pursuant to Section 15 of the Project Agreement as a result of such Enterprise Change; and

V. a preliminary identification and assessment of any other reasonably anticipated material impact on the Work of such Enterprise Change.

c. Promptly after, and in any event within 20 Working Days after, the later of Developer's receipt of an Enterprise Change Notice and any preliminary meeting held pursuant to Section 1.1.b.ii.A of this Schedule 24 (or, if later, by the date specified in any Enterprise Change Notice, or such date as is otherwise agreed at any such meeting), Developer shall submit to the Enterprises either:

i. Developer's written response to the Enterprise Change Notice ("Developer's Enterprise Change Response"), which response shall be signed by the Developer's Representative and include each of the following elements (or a statement to the effect that such element is not relevant to the proposed Enterprise Change):

A. an introductory summary of the contents of such response;

B. a detailed scope of work for such Enterprise Change, together with:

I. a schedule for implementation of such scope of work; and

II. a Revised Baseline Schedule reflecting adjustments required to implement such Enterprise Change;

C. the proposed method(s) for certification of completion of any aspects of the work required by such Enterprise Change, where such methods shall, to the extent possible, follow procedures already set out in this Agreement;

D. any new Governmental Approvals, Permits or third-party consents, and/or any amendments to existing Governmental Approvals, Permits or third-party consents, required to implement such Enterprise Change;

E. any amendments to this Agreement required to implement such Enterprise Change;

F. an analysis of any extension of time and/or relief to which Developer may be entitled pursuant to Section 15 of the Project Agreement as a result of such Enterprise Change, including a time impact analysis (made by reference to the Revised Baseline Schedule referred to in Section 1.1.c.i.B.II of this Schedule 24, and otherwise that complies with the requirements for such an analysis set out in relation to paragraph B.7 of Part B of Schedule 21 (*Forms of Supervening Event Notices and Submissions*)) of the effect (if any) of such Enterprise Change on achievement of any Key Milestone;

G. the estimated Change in Costs, Delay Financing Costs and/or Milestone Payment Delay Costs to which Developer may be entitled, pursuant to Section 15 of the Project Agreement, as a result of such Enterprise Change, including a detailed breakdown of each element of the same (which detailed breakdown shall include all proposed contingencies with respect to estimated Change in Costs);

H. identification and analysis of any reasonably anticipated impact of such Enterprise Change on the Environmental Requirements, or an express confirmation that there will be no such impact, in each case as certified by the "Environmental Manager", initially as identified in Schedule 27

(Key Personnel), subject to replacement pursuant to Section 16.2 of the Project Agreement;

I. identification and analysis of any other reasonably anticipated impact on the Work of such Enterprise Change;

J. such supporting information and documentation as the Enterprises may reasonably require in such Enterprise Change Notice; and

K. the following certification: "Under penalty of perjury, the undersigned certifies on behalf of Developer that, to the best of Developer's knowledge (after due inquiry), as of the date hereof, the requests, claims, representations, statements, disclosures and information contained in this Developer's Enterprise Change Response are correct, complete (other than as expressly indicated herein) and not materially misleading."; or

ii. Developer's written rejection of the proposed Enterprise Change (or any part thereof) on the basis that it is a Restricted Change, including a supporting analysis.

1.2. **Processing of Enterprise Change Notices**

a. The Parties shall arrange to meet, at such time and location as the Enterprises may reasonably request, to review and discuss Developer's Enterprise Change Response or Developer's written rejection submitted pursuant to Section 1.1.c of this Schedule 24.

b. At any meeting arranged pursuant to Section 1.2.a of this Schedule 24, or otherwise upon written notice, the Enterprises may in their discretion request or require modifications to Developer's Enterprise Change Response, including to require Developer to solicit competitive bids for all or part of the work that would result from the proposed Enterprise Change, provided that such modifications shall not result in a Restricted Change.

c. Developer shall promptly after, and in any event within 15 Working Days after, Developer's receipt of any notice from the Enterprises pursuant to Section 1.2.b of this Schedule 24, notify the Enterprises of any consequential changes to its prior Developer's Enterprise Change Response.

d. Promptly after, and in any event within 15 Working Days after, the latest of the date of:

i. the Enterprises' receipt of Developer's Enterprise Change Response;

ii. any meeting referenced in Section 1.2.a of this Schedule 24; and

iii. any Developer response to the Enterprises pursuant to Section 1.2.c of this Schedule 24,

the Enterprises shall:

iv. Accept Developer's Enterprise Change Response (as updated pursuant to Section 1.2.c of this Schedule 24);

v. without prejudice to their right to issue a Directive Letter pursuant to Section 1.4.a of this Schedule 24, request or require additional modifications (including modifications as to estimated Change in Costs (including any such modifications made to the methodology for calculating Change in Costs pursuant to Section 3 of Appendix A of this Schedule 24), Delay Financing Costs or Milestone Payment Delay Costs) to Developer's Enterprise Change Response (if applicable, as previously updated pursuant to Section 1.2.c of this Schedule 24), in which case the procedures set out in Sections 1.2.b and 1.2.c and this Section 1.2.d of this Schedule 24 shall be repeated; or

vi. other than with respect to an Enterprise Change Notice that the Enterprises are required to issue pursuant to Section 8.6.2.b of the Project Agreement, withdraw the Enterprise Change Notice and thereafter promptly reimburse Developer for all reasonable and documented external professional costs and expenses (and for any equivalent internal costs and expenses, but only to the extent Developer demonstrates to the Enterprises' reasonable satisfaction that such costs and expenses were incurred in lieu of and at a savings relative to external professional costs and expenses) incurred by it in preparing Developer's Enterprise Change Response pursuant to Section 1.1.c.i of this Schedule 24 (or any update thereto pursuant to Sections 1.2.c and 1.2.d of this Schedule 24).

e. Following the Enterprises' Acceptance of any Developer's Enterprise Change Response pursuant to Section 1.2.d.iv of this Schedule 24, the Parties shall promptly execute a written memorandum (a "Change Order"), in a form to be prepared by the Enterprises, and on terms agreed by the Parties (acting reasonably, including by taking into account (i) the substance of the Accepted Developer's Enterprise Change Response and (ii) the treatment of Enterprise Changes as Compensation Events pursuant to Section 1.3 of this Schedule 24), definitively stating (or, at Enterprises' reasonable discretion, confirming by way of attachment and reference to the Enterprise Change Notice and/or Developer's Enterprise Change Response) all details of the relevant Enterprise Change, including as to:

i. any extension of time, relief and/or compensation (including the payment terms of, and supporting documentation required for, any such compensation);

ii. any sharing of savings with the Enterprises pursuant to Section 3 of this Schedule 24; and

iii. the agreed commencement date and schedule for the relevant work.

1.3. **Implementation of Enterprise Changes**

a. Developer shall begin to implement the relevant Enterprise Change on the commencement date set out in the relevant Change Order.

b. Subject to the terms of the relevant Change Order, from the date on which a Change Order implementing an Enterprise Change is effective (or, with respect to an Enterprise Change initiated pursuant to Section 8.6.2 of the Project Agreement, such earlier date as is specified in the relevant Change Order):

i. the relevant Enterprise Change shall constitute a Compensation Event;

ii. the Change Order shall constitute an agreed memorandum for purposes of Section 15.3.2 of the Project Agreement, for certainty without any obligation for Developer to submit a Supervening Event Notice or Supervening Event Claim pursuant to Section 15.1 of the Project Agreement;

iii. Developer shall be entitled to extensions of time, relief and/or compensation pursuant to Sections 15.3 through 15.6 of the Project Agreement, for certainty without Section 15.7 of the Project Agreement applying to the calculation of any such compensation; and

iv. the Enterprises shall be entitled to share in any savings resulting from the implementation of the relevant Enterprise Change pursuant to Section 3 of this Schedule 24.

1.4. **Directive Letters**

a. At any time after the Enterprises' submission of an Enterprise Change Notice to Developer, and for so long as the Parties have not reached a final agreement and executed a Change Order in relation thereto, the Enterprises may (in their discretion) deliver to Developer a notice (a "Directive Letter") directing Developer to implement and

perform the work as set out in such Enterprise Change Notice (as may be modified by such Directive Letter). Subject to the terms of any agreed Change Order that supersedes such Directive Letter, the Enterprises' delivery of a Directive Letter shall constitute a Compensation Event in respect of which Developer shall be entitled to submit a Supervening Event Submission pursuant to Section 15.1.2.b of the Project Agreement and all relevant provisions of Section 15 of the Project Agreement shall apply (except that, for certainty, Section 15.7 of the Project Agreement shall not apply to the calculation of any resulting compensation).

b. Any Directive Letter shall:

i. state that it is issued pursuant to Section 1.4.a of this Schedule 24;

ii. describe the work in question and any limits thereon to the extent not otherwise provided in the relevant Enterprise Change Notice; and

iii. specify the required commencement date of the relevant work together with any other implementation schedule and completion requirements.

c. Promptly upon receipt of any Directive Letter, Developer shall implement and perform the work in question as directed by the Enterprises, provided that Developer shall be entitled to give notice to the Enterprises (including a supporting analysis) if it refuses to perform any part of such work on the basis that it constitutes a Restricted Change.

2. DEVELOPER CHANGES

2.1. Delivery of Developer Change Notices

a. Developer shall be entitled to submit Developer Change Notices to the Enterprises for Approval pursuant to Section 14.1.b of the Project Agreement.

b. Any Developer Change Notice shall be signed by the Developer's Representative and include each of the following elements (or a statement to the effect that such element is not relevant to the proposed Developer Change):

i. an introductory summary of the contents of such notice;

ii. a statement as to Developer's reasons for proposing the Developer Change, including as to whether such Developer Change is being proposed by Developer as an alternative to a Nonconforming Work Remedy (a "Nonconforming Work Change");

iii. reasonably sufficient detail regarding the proposed Developer Change to enable the Enterprises to evaluate Developer's proposal in full, including:

A. other than with respect to a Nonconforming Work Change:

I. a detailed scope of work for such proposed Developer Change, together with:

a. a schedule for implementation of such scope of work; and

b. a Revised Baseline Schedule reflecting adjustments required to implement such Developer Change; and

II. the proposed method(s) for certification of completion of any aspects of the work required by such Developer Change, where such methods shall, to the extent possible, follow procedures already set out in this Agreement;

B. any new Governmental Approvals, Permits or third-party consents, and any amendments to existing Governmental Approvals, Permits or third-party consents, required to implement such Developer Change;

C. any amendments to this Agreement required to implement such Developer Change;

D. identification and analysis of any reasonably anticipated impact of such Enterprise Change on the Environmental Requirements, or express confirmation that there will be no such impact, in each case as certified by the Environmental Manager; and

E. identification and analysis of any other reasonably anticipated impact on the Work of such Developer Change;

iv. the estimated Change in Costs (which, for certainty, may be positive (other than with respect to any Nonconforming Work Change) or negative) that may result from such Developer Change, including a detailed breakdown of each element of the same (which detailed breakdown shall include all proposed contingencies with respect to estimated Change in Costs), provided that, with respect to any Nonconforming Work Change, Developer shall, to the extent such methodology is applicable to the relevant Nonconforming Work Change, calculate relevant elements of the estimated Change in Costs (including the resulting reduction in the value of the Work performed) by reference to the methodology set out in the provisions of the CDOT Standard Specifications relating to price adjustments relating to Nonconforming Work;

v. Developer's proposed methods of financing or funding any such positive Change in Costs and/or details regarding proposed payments by or to the Enterprises, including changes to the Milestone Payments and/or Performance Payments, if any, being requested or proposed by Developer (including as a result of the application of Section 3 of this Schedule 24), provided that no payments may be proposed to be made by the Enterprises to Developer in connection with any Nonconforming Work Change;

vi. any dates by which a response by the Enterprises to such notice is critical;

vii. such supporting information and documentation as the Enterprises may reasonably require; and

viii. the following certification: "Under penalty of perjury, the undersigned certifies on behalf of Developer that, to the best of Developer's knowledge (after due inquiry), as of the date hereof, the requests, claims, representations, statements, disclosures and information contained in this Developer Change Notice are correct, complete (other than as expressly indicated herein) and not materially misleading."

2.2. **Processing of Developer Change Notices**

a. Any Developer Change Notice shall be subject to the Enterprises' Approval, provided that the Enterprises agree to evaluate any Developer Change Notice in good faith, taking into account all issues that are relevant to the Enterprises, including whether, with respect to the proposed Developer Change:

i. a change in the Milestone Payments and/or Performance Payments has been proposed by Developer;

ii. such Developer Change would or may affect the quality of the Work or the likelihood of successful or timely delivery of the Work;

iii. such Developer Change would or may interfere with the relationship of the Enterprises and/or CDOT with third parties (including any Governmental Authority);

iv. the financial strength of Developer is sufficient to perform the Work (as modified by such Developer Change);

v. the value of the Work and/or the residual value of the Project would or may be affected, including as a result of a Nonconforming Work Change; and

vi. such Developer Change would or may materially affect the risk, costs or liabilities to which the Enterprises will or may be exposed.

b. As part of the Enterprises' evaluation of a Developer Change Notice, the Parties shall, at the Enterprises' discretion, arrange to meet at such time and location as the Enterprises may reasonably request to review and discuss the proposed Developer Change.

c. Following the Enterprises' Approval of any Developer Change Notice (including with such conditions or modifications (including modifications as to estimated Change in Costs) as may be required by the terms of such Approval) the Parties shall promptly execute a written Change Order in a form to be prepared by the Enterprises definitively stating (or, at Enterprises' discretion, confirming by way of attachment and reference to the Developer Change Notice) all details of the relevant Approved Developer Change, including as to:

i. any extension of time, relief and/or compensation (including the payment terms of, and supporting documentation required for, any such compensation);

ii. any sharing of savings with the Enterprises pursuant to Section 3 of this Schedule 24; and

iii. the agreed commencement date and schedule for the relevant work.

d. Developer shall begin to implement the relevant Developer Change on the commencement date set out in the agreed Change Order (or such other date as may be agreed by the Parties).

e. Subject to the terms of the relevant Change Order, from the date on which a Change Order implementing a Developer Change is effective:

i. Developer shall be, and shall only be, entitled to such extensions of time, relief and/or compensation in connection with such Developer Change as may be set out in the relevant Change Order; and

ii. the Enterprises shall be entitled to:

A. share, pursuant to Section 3 of this Schedule 24, in any savings resulting from the implementation of the relevant Developer Change; and

B. reimbursement by Developer for any external fees and expenses incurred by the Enterprises and/or CDOT in connection with reviewing and Approval of the Developer Change Notice and associated Change Order.

3. Cost Savings

3.1. If in connection with any Change documented in a Change Order or a Directive Letter:

a. Developer's Change in Costs reflects a net saving to Developer; and/or

b. with respect to any Nonconforming Work Change, the value of the Work performed, or of the Project, has been reduced,

then, subject to the terms of any relevant Change Order and, with respect to a Directive Letter, any written memorandum executed pursuant to Section 15.3.2 of the Project Agreement:

c. with respect to any Enterprise Change (whether documented in a Change Order or a Directive Letter) or any Nonconforming Work Change, the Enterprises shall be entitled to 100% of such net saving and/or such reduction in value; and

d. with respect to any Developer Change (other than any Nonconforming Work Change), Developer and the Enterprises shall each be entitled to 50% of any such net saving.

3.2. The Enterprises shall be entitled, at their discretion, to elect to receive their share of any saving and/or reduction in value pursuant to Section 3.1 of this Schedule 24:

a. as a lump sum payment (or series of payments) from Developer within 30 Calendar Days after;

i. such saving (or a portion thereof) is realized; or

ii. with respect to any reduction in value as a result of a Nonconforming Work Change, the date of the relevant Change Order;

b. by way of an adjustment to the "Base CPP" and/or the "Base OMRP" set out in Section 2(f) of Part 2 of Schedule 6 (*Performance Mechanism*); or

c. by way of set-off pursuant to Section 5 of Part 3 of Schedule 4 (*Payment*) against amounts otherwise payable by them to Developer.

Appendix A
Change in Cost Calculation Methodology

1. Calculating Change in Cost

Subject to:

a. the exceptions set out in the definitions of Change in Costs, Excess Costs and Excess Groundwater Costs in Part A of Annex A (*Definitions and Abbreviations*) to the Project Agreement; and

b. Section 3 of this Appendix A to this Schedule 24,

the methodology set out in Section 2 of this Appendix A to this Schedule 24 shall be used for calculating Change in Costs, Excess Costs and Excess Groundwater Costs in accordance with the definitions thereof.

2. Calculation Methodology

2.1. **Labor Costs**

a. General

The cost of labor shall be separately calculated with respect to construction labor and non-construction labor (such categories to be applied without reference to whether the relevant work is performed during the Construction Period or the Operating Period) pursuant to Sections 2.1.b and 2.1.c of this Appendix A to this Schedule 24. The cost of labor shall in all cases be calculated based on straight time for all hours worked, unless the Enterprises' Approve overtime in advance. The use of a labor classification that would increase the resulting Change in Cost shall not be permitted without the Enterprises' Approval.

b. Construction labor

The cost of construction labor shall equal the sum of the following in respect of each relevant worker:

i. actual wages (i.e. the base wage paid to the worker exclusive of any non-cash fringe benefits) for every hour that the relevant worker is actually engaged in the relevant work, as documented by certified payrolls; *plus*

ii. actual costs paid to, or on behalf of, such worker by reason of subsistence and travel allowances, health and welfare benefits, pension fund benefits, or other benefits, but only when such amounts are required to be paid by a collective bargaining agreement; *plus*

iii. a labor surcharge of 67% of the wages referred to in Section 2.1.b.i of this Appendix A to this Schedule 24, which shall constitute full compensation for all state and Federal payroll, unemployment and other Taxes, insurance, non-cash fringe benefits (including health insurance, retirement plans, vacation, sick leave, and bonuses) and overhead to the extent not included in the costs falling within Section 2.1.b.ii of this Appendix A to this Schedule 24.

c. Non-construction labor

The cost of non-construction labor shall equal the sum of the following in respect of each relevant worker:

i. actual wages (i.e. the base wage paid to the worker exclusive of any non-cash fringe benefits) paid for every hour that the relevant worker is actually engaged in the relevant work as documented by a method agreed by the Enterprises and Developer (or, absent agreement, determined by the Enterprises (acting reasonably)); *plus*

ii. a labor surcharge of 140% of the wages referred to in Section 2.1.c.i of this Appendix A to this Schedule 24, which shall constitute full compensation for all state and Federal payroll, unemployment and other Taxes, insurance, non-cash fringe benefits (including health insurance, retirement plans, vacation, sick leave, and bonuses) and overhead.

d. Design labor

The cost of design labor shall equal the sum of the following in respect of each relevant worker:

i. actual wages (i.e. the base wage paid to the worker exclusive of any non-cash fringe benefits) paid for every hour that the relevant worker is actually engaged in the relevant work, as documented by a method agreed by the Enterprises and Developer (or, absent agreement, by the Enterprises (acting reasonably)); *plus*

ii. a labor surcharge of 140% of the wages referred to in Section 2.1.d.i of this Appendix A to this Schedule 24, which shall constitute full compensation for all state and Federal payroll, unemployment and other Taxes, insurance, non-cash fringe benefits (including health insurance, retirement plans, vacation, sick leave, and bonuses) and overhead; *plus*

iii. an allocation for profit of 10% applied to the aggregate of actual wages (calculated pursuant to Section 2.1.d.i of this Appendix A to this Schedule 24) plus labor surcharge (calculated pursuant to Section 2.1.d.ii of this Appendix A to this Schedule 24).

2.2. **Materials Costs**

a. General

i. Material costs shall be the actual cost (supported by valid quotes and invoices from Suppliers) of all materials to be used in the performance of the relevant work including normal wastage allowance as determined by reference to Good Industry Practice, subject to the requirements set out in this Section 2.2 of this Appendix A to this Schedule 24. The cost may include applicable local (within the State) sales and use taxes (but not State Sales Tax or any other Taxes), freight and delivery charges and any allowable discounts (exclusive of machinery rentals).

ii. The resulting price allowed for materials as determined pursuant to Section 2.2.a.i of this Appendix A to this Schedule 24 shall be subject to adjustment pursuant to Sections 2.2.b and 2.2.c of this Appendix A to this Schedule 24.

b. Affiliated Source of Supply

If materials are obtained from a supply or source owned in whole or in part by Developer or any other Developer-Related Entity:

i. the cost of such materials shall not exceed the lowest of (A) the lowest price charged by Developer or any such Developer-Related Entity, as applicable, for similar materials furnished to other projects, (B) the lowest price charged by Developer or any such Developer-Related Entity, as applicable, for similar materials otherwise furnished to the Project and (C) the current available wholesale price for such materials; and

ii. to the extent such materials were not specifically purchased for the relevant work, Developer shall furnish an affidavit from itself, or from such other Developer-Related Entity that owns the supply or source of such materials, in either case certifying that such materials were taken from Developer's or such other Developer-Related Entity's stock, that the quantity claimed was actually

used, and that the price and transportation costs claimed represent actual costs to Developer.

c. Excessive and Undocumented Materials Cost

If:

i. the cost of materials as otherwise determined pursuant to Section 2.2.a of this Appendix A to this Schedule 24 is, in the Enterprises' reasonable opinion, excessive relative to what the Enterprises consider to be the lowest current available wholesale price, in the quantities needed and delivered to the Site; or

ii. Developer does not furnish to the Enterprises reasonably satisfactory evidence of the actual cost of materials from the Supplier thereof within 60 Calendar Days after the date of delivery of the materials,

for the purposes of calculating the Change in Costs, the cost of such materials shall be deemed to be the lowest current wholesale price, as determined by the Enterprises (acting reasonably), at which such materials are available, in the quantities needed and delivered to the Site.

2.3. **Equipment**

a. Blue Book

The cost of the use of equipment owned or rented by Developer or any Subcontractor for use in the relevant work shall be equal to the lesser of (x) the actual cost charged for use of such equipment and (y) an amount calculated, pursuant to this Section 2.3 of this Appendix A to this Schedule 24, at an hourly rate derived from the most recent Rental Rate Blue Book of Rental Rates for Construction Equipment (the "Blue Book") (or any equivalent successor publication as reasonably determined by the Enterprises), which is in effect at the time of commencement of the relevant work resulting in a Change in Costs. The total hourly rates (comprised of the Operating Rate and the Standby Rate, as calculated in accordance with Section 2.3.b of this Appendix A to this Schedule 24) derived from the Blue Book:

i. shall be computed from equipment costs currently in effect;

ii. shall not include costs for operating personnel; and

iii. shall be adjusted by each applicable "Regional Factor" and "Depreciation Factor" found in the front of each chapter in the Blue Book.

Notwithstanding the foregoing, in no circumstances shall the equipment costs for pickup trucks used solely for transportation of people and small tools (as described in Section 2.3.e of this Appendix A) be considered eligible for inclusion as a Change in Costs.

b. Rate Categories

Subject to Section 2.3.a of this Appendix A to this Schedule 24, equipment use rates shall be comprised of the following two categories (in each case where "BBMR" equals the relevant Blue Book monthly rate adjusted for year of manufacture):

i. Operating Rate: This rate applies to those hours equipment is actually in use, includes ownership and operating costs, and shall equal:

((BBMR / 176) times 1.06) + Estimated Hourly Operating Costs from the Blue Book

ii. Standby Rate: This rate applies to equipment required to be at the Site but not operating, includes ownership costs only, and shall equal

((BBMR / 176) times 1.06) x 0.5

The duration of allowable standby time is subject to Acceptance by the Enterprises with a maximum of eight hours per day or 40 hours in a normal week.

When the "manufacturer's rated capacity" falls between those shown in the Blue Book, the closest rated capacity will be used, without interpolation, for purposes of determining the BBMR.

c. Specialized Equipment

i. In cases where the equipment to be used is specialized in nature, is not available in Developer's or any other Developer-Related Entity's inventory and is rented or leased from an outside agency, a 10% allowance will be added on the first (indexed with respect to any such cost incurred in connection with a Compensation Event or a Developer Change that occurs during the Operating Period) *plus* 5% of the balance in excess of such first amount for overhead for all rented or leased equipment paid for by invoices.

ii. Where the rate charged for equipment that is specialized in nature by such outside agency exceeds the rate determined by the Blue Book, the rental or lease agreement shall be subject to the Enterprises' Acceptance.

iii. The operating costs from the Blue Book shall be paid for rented or leased equipment that is specialized in nature for each hour the equipment was actually used.

d. Rented Equipment

i. In those cases where the required equipment is in Developer's or any other Developer-Related Entity's available inventory but not on the Site, the equipment may be rented from a local source.

ii. The Enterprises may Accept rental rates for such equipment obtained from local sources when such rates are within 10% of rates in the Blue Book.

iii. When such equipment use is of short duration (i.e., less than a calendar week) "move-in" and "move-out" costs for equipment owned by Developer or any other Developer-Related Entity may be considered when comparing rental costs of equipment obtained from local sources. This option will only be allowed when the cost of locally rented equipment would be less than using owned equipment, including such "move-in" and "move-out" charges, and supported by a cost analysis indicating the method used was the least expensive.

iv. Should equipment be rented even though it is of a type that is in Developer's or any other Developer-Related Entity's inventory and the rental costs exceed that allowed by this provision, Developer will be reimbursed for such equipment based on the rates in the Blue Book.

e. Small Tools

The rates paid pursuant to this Section 2.3 of Appendix A to this Schedule 24 shall be deemed in all cases to include compensation for the cost of fuel, oil, lubricants, supplies, small tools, necessary attachments, repairs and maintenance of all kinds, depreciation, storage, insurance and all incidentals. Individual pieces of equipment or tools not listed in the Blue Book and having an individual replacement value of (indexed with respect to any such cost incurred in connection with a Compensation Event or a Developer Change that occurs during the Operating Period) or less, whether or not consumed by use, shall be considered to be "small tools". Equipment rental rates for such pieces of equipment or tools not listed in the Blue Book must be Accepted by the Enterprises before the relevant work is begun.

f. Equipment Operators

Costs in respect of equipment operators shall be calculated pursuant to Section 2.1 of this Appendix A to this Schedule 24.

g. Classification of Equipment

Unless otherwise specified, manufacturer's ratings and manufacturer-approved modifications shall be used to classify equipment for the determination of applicable rental rates.

h. Computation of Time

The time to be paid for use of equipment on the Site shall be the time the equipment is in operation on the relevant portion of the work being performed in connection with the calculation of Change in Costs. The time shall include the reasonable time required to move the equipment to the location of the relevant work and return it to the original location or to another location requiring no more time than that required to return it to its original location. Moving time will not be paid for if the equipment is also used at the Site other than in connection with the event for which Change in Costs are calculated. Loading and transporting costs will be allowed, in lieu of moving time, when the equipment is moved by means other than its own power. No payment for loading and transporting will be made if the equipment is also used at the Site other than in connection with the event for which Change in Costs are calculated. Time will be computed in half and full hours. In computing the time for use of equipment, less than 30 minutes shall be considered one-half hour.

2.4. **Governmental Approval and Permit Fees**

Developer shall be entitled to reimbursement for the cost of any additional Governmental Approval and Permit fees payable as the result of the Change in Costs.

2.5. **Other Direct Costs**

For certainty, Developer shall be reimbursed for any direct costs not otherwise included in Sections 2.1 through 2.4 of this Appendix A to this Schedule 24 to the extent such direct costs are included in paragraphs a.iv. and a.v. of the definition of Change in Costs in Part A of Annex A (*Definitions and Abbreviations*) to the Project Agreement.

2.6. **Mark-Ups**

a. Mark-Ups Generally

In addition to any element of any Change in Costs as otherwise calculated pursuant to this Appendix A to Schedule 24, pursuant to Section 2.6.c of this Appendix A to this Schedule 24 the following mark-ups ("Permitted Mark-Ups") shall apply:

i. 15% for labor costs calculated in accordance with Section 2.1.b of this Appendix A to this Schedule 24;

ii. 10% for labor costs calculated in accordance with Section 2.1.c of this Appendix A to this Schedule 24;

iii. 15% for material costs calculated in accordance with Section 2.2 of this Appendix A to this Schedule 24 (provided that no mark-up shall be permitted on any materials or equipment furnished by the Enterprises);

iv. 10% for equipment use costs calculated in accordance with Section 2.3 of this Appendix A to this Schedule 24;

v. 5% for Governmental Approval and Permit fees calculated in accordance with Section 2.4 of this Appendix A to this Schedule 24;

vi. 5% for other direct costs calculated in accordance with Section 2.5 of this Appendix A to this Schedule 24; and

vii. 5% for Developer's subcontracting of the relevant work as calculated in accordance with Section 2.6.c.ii of this Appendix A to this Schedule 24.

b. Items Included in Mark-Ups

i. Permitted Mark-Ups are full and complete compensation for:

A. all overhead;

B. small tools (as described in Section 2.3.e of this Appendix A to this Schedule 24);

C. consumables (items which are consumed in the performance of the work which are not a part of the finished product); and

D. other indirect costs of the relevant work,

in each case, including (x) profit and (y) any and all costs and expenses incurred due to any delay in connection with the relevant work (to the extent not expressly included in paragraphs a.vii. and a.viii. of the definition of Change in Costs in Part A of Annex A (*Definitions and Abbreviations*) to the Project Agreement or as Delay Financing Costs or Milestone Payment Delay Costs).

ii. Permitted Mark-Ups shall be considered to include:

A. bond premiums;

B. incidental job burdens;

C. bonuses not otherwise covered;

D. field, jobsite and general home office expenses of all types (e.g. timekeepers, bookkeepers and other general office help);

E. supervisory expenses of all types (excluding only direct supervision of force account work); and

F. all other overhead, general condition and indirect costs and expenses,

provided that, with respect to non-construction work related labor costs (as determined pursuant to Section 2.1.c of this Appendix A to this Schedule 24), overhead is included as part of the labor surcharge calculated pursuant to Section 2.1.c of this Appendix A to this Schedule 24, and includes accessories such as computer-assisted drafting and design (CADD) systems, computers, facsimile transmission machines, scanners, paper, etc.

c. Payment of Mark-Ups

i. With respect to any relevant work that Developer self-performs, the Permitted Mark-Ups shall apply to any Change in Costs incurred by Developer itself and not by any Subcontractor (excluding, for certainty, the mark-up referred to in Section 2.6.a.vii of this Appendix A to this Schedule 24).

ii. With respect to any relevant work that Developer subcontracts, the Permitted Mark-Ups shall apply to any Change in Costs incurred by the Subcontractor that performs the relevant work (excluding, for certainty, the mark-up referred to in Section 2.6.a.vii of this Appendix A to this Schedule 24, which shall apply to Developer).

2.7. **Savings**

When in connection with any Change documented in a Change Order or a Directive Letter, the resulting Change in Costs involves results in a net aggregate saving to Developer or a net aggregate reduction in value of the work performed or of the Project (or any individual element of the calculation of the Change in Costs, whatever the net aggregate result, involves such a saving

or such a reduction in value), Change in Costs shall be calculated to take into account all Developer's (and, without double-counting, each relevant Subcontractor's) (a) otherwise increased profits and (b) avoided or avoidable overhead.

3. Unit Price Change Orders

a. The Enterprises may, in their discretion, in an Enterprise Change Notice, require Developer to calculate Change in Costs (other than such costs as are described in paragraph a.viii. of the definition of Change in Costs in Part A of Annex A (*Definitions and Abbreviations*) to the Project Agreement) both by reference to the methodology set out in Section 2 of this Appendix A to this Schedule 24 and on an alternative "unit price" basis, on which basis the "unit price":

i. shall be the sum of:

A. a "base unit price", which shall be deemed to include (and be limited to) all Subcontractor (including Principal Subcontractor) costs for labor, material, overhead, and profit; *plus*

B. a "risk mark-up", which shall be deemed to include all Subcontractor (including Principal Subcontractor) contingencies (provided that such risk adjustment shall not exceed 5% of the "base unit price"); and

ii. shall not be subject to subsequent adjustment regardless of any change in the estimated quantities.

b. Subject to the specific directions or requirements set out in the relevant Enterprise Change Notice, the Developer shall use both methodologies to calculate Change in Costs in any preliminary cost estimate delivered pursuant to Section 1.1.b.ii.B of this Appendix A to this Schedule 24 and in the Developer's Enterprise Change Response.

c. The Enterprises and Developer may thereafter agree to calculate Change in Costs in any resulting Change Order on a unit price basis, with measurement of unit-priced quantities to be as specified in the Change Order. Absent agreement as to the method of calculation, the Enterprises may in their discretion require any resulting Change Order to calculate Change in Costs on a unit price basis instead of the methodology set out in Section 2 of this Appendix A to this Schedule 24, provided that the calculation of such basis has itself been previously agreed with Developer.

Schedule 25
Dispute Resolution Procedure

1. **Amicable Dispute Settlement**

   a. The Parties shall attempt to reach an amicable settlement of any Dispute prior to referring such Dispute for resolution pursuant to Section 2 of this Schedule 25; provided that either Party may at any time elect in its discretion to directly refer such Dispute for resolution pursuant to Section 2 of this Schedule 25 if it determines that such a settlement is unlikely to occur. Any such attempt may be made by any representatives of the Parties, regardless of their level of seniority or position, provided that:

      i. such representatives have the authority, capacity and competency to make such attempt; and

      ii. any resulting written memorandum or similar document referenced in Section 1.b of this Schedule 25 is duly executed by such other representatives of the Parties as may be necessary with respect to such a written agreement.

   b. Upon agreement on any such amicable settlement, the Parties shall execute a written memorandum or similar document in a form to be prepared by the Enterprises (unless the Enterprises otherwise delegate such preparation to Developer, in which case Developer shall prepare such memorandum or document) setting out the details of such settlement, and such document shall be considered a binding settlement agreement.

2. **Designated Senior Representatives**

   a. Upon referral by either Party pursuant to Section 1.a of this Schedule 25, the Designated Senior Representatives shall confer and otherwise use Reasonable Efforts to resolve the Dispute for a period of at least 15 Working Days (or such longer period as is mutually agreed by the Parties in writing).

   b. If the Parties succeed in resolving a Dispute following such referral to their Designated Senior Representatives, they shall memorialize the resolution by executing a written memorandum or similar document in a form to be prepared by the Enterprises (unless the Enterprises otherwise delegate such preparation to Developer, in which case Developer shall prepare such memorandum or document) setting out the details of such resolution, and such document shall be considered a binding settlement agreement.

   c. If the Designated Senior Representatives are unable to resolve the Dispute within such 15 Working Day period (or such longer period as is mutually agreed by the Parties), either Party may refer the Dispute for resolution by the Dispute Resolution Panels in accordance with Section 5 of this Schedule 25.

3. **Advisory Opinions**

   a. Notwithstanding Section 2 of this Schedule 25, the Parties, acting jointly, may, at any time prior to formally referring a Dispute for resolution by the Dispute Resolution Panels pursuant to Section 5 of this Schedule 25, seek an advisory opinion regarding such Dispute from one or both Dispute Resolution Panels. The Parties shall do so by submitting a written request to the applicable Panel(s) containing:

      i. a concise summary of the nature and background of the Dispute and of the facts relevant to the Dispute;

      ii. a statement of the question or issue on which the Parties are seeking an advisory opinion; and

      iii. copies of any correspondence, reports or other documents to which the Parties wish to refer.

b. Any advisory opinion shall:

i. be given in writing (unless otherwise requested by both Parties);

ii. be non-binding; and

iii. not prejudice any further resolution of such Dispute.

4. **Treatment of Settlement Negotiations and Settlement Agreements**

a. Statements made by the Parties, including by their Representatives and Designated Senior Representatives, during any meetings or in any communications related to efforts to amicably settle or resolve a Dispute pursuant to Sections 1 and 2 of this Schedule 25 (including by seeking an advisory opinion from the Dispute Resolution Panels pursuant to Section 3 of this Schedule 25), and documents containing statements or opinions specifically prepared in connection with the same (including any such advisory opinion given following a request of the Parties in accordance with Section 3 of this Schedule 25), shall be considered part of settlement negotiations and shall not be admissible as evidence in any proceeding between the Parties of any kind (including any subsequent referral to the Dispute Resolution Panels) without the mutual written consent of the Parties, provided that any Party:

i. that prepares demonstrative exhibits or summary exhibits of evidence; or

ii. that retains experts or other Persons employed in a professional capacity to provide expert opinions and/or reports, which opinions and/or reports are prepared for presentation to the Dispute Resolution Panels,

shall be entitled to submit or otherwise use such work product in any subsequent proceeding.

b. Unless otherwise agreed in writing by both Parties, neither Party may submit a settlement agreement entered into by the Parties pursuant to Sections 1.b, 2.b or 5.r of this Schedule 25 to a Dispute Resolution Panel in connection with any subsequent proceeding.

5. **Dispute Resolution Panels**

a. Two separate Dispute Resolution Panels shall be created pursuant to the Project Agreement and this Schedule 25: a “Technical Panel” and a “Commercial Panel”. Subject to Sections 1 and 2 of this Schedule 25, any Dispute may be referred by either Party in accordance with this Section 5 of this Schedule 25:

i. to the extent such Dispute is of a technical nature, for resolution by the Technical Panel; or

ii. to the extent such Dispute is of a financial, commercial and/or legal nature, for resolution by the Commercial Panel,

provided that the Parties shall not refer Disputes with respect to the existence or legal validity of the Project Agreement to either Panel for determination nor shall either Panel make any determination relating to any such matter.

b. Either Party, acting reasonably, may initially refer any Dispute (or a relevant part thereof, with the remainder to be considered by a single Panel) to the Commercial Panel and the Technical Panel jointly. Alternatively, if a Dispute was initially referred to a single Panel, such Panel or either Party, acting reasonably, may subsequently request the other Panel to jointly consider such Dispute (or relevant part thereof, with the remainder to be considered by the Panel to which the Dispute was initially referred).

c. i. Each Panel shall consist of three persons who shall be and remain independent of the Parties, impartial and without any conflict of interest or any appearance of a conflict of interest.

ii. No later than the date provided in Section 5.d of this Schedule 25 and otherwise, if the relevant Panel is not then in existence, no later than 15 Working Days after a Dispute is referred to a Panel, each Party shall appoint one person as a member of each Panel. If either Party fails to appoint a person as a member of either Panel, the relevant member of the Panel shall be appointed by the International Institute for Conflict Prevention and Resolution, upon the request of the other Party. Any person appointed pursuant to this Section 5.c.ii of this Schedule 25:

A. if appointed to the Commercial Panel, shall have relevant experience on similar projects (for certainty, such experience need not be on projects that fall within the definition of Similar Projects in Part A of Annex A (*Definitions and Abbreviations*) to the Project Agreement) and shall be an expert in financial and commercial matters relevant to the Project; and

B. if appointed to the Technical Panel, shall have relevant experience on Similar Projects and shall be, if appointed during the Construction Period, an expert in engineering and construction matters relevant to the Project and, if appointed during the Operating Period, an expert in operations and maintenance matters relevant to the Project (including in relation to Renewal Work and Handback Work).

iii. A third person (the "Chairperson") (which person, with respect to the Commercial Panel only, shall be a lawyer barred and in good standing in the State of Colorado and shall have been so for not less than eight years), shall be jointly appointed by agreement of the two members of the Panel as previously appointed pursuant to Section 5.c.ii of this Schedule 25 no later than 10 Working Days following their appointment. In the event of a failure to agree on the appointment of the Chairperson of the relevant Panel, such Chairperson shall be appointed by the International Institute for Conflict Prevention and Resolution, upon the request of either Party.

iv. Subject to the following, the costs and expenses payable to the members of each Panel shall be agreed by the Parties and, absent agreement, shared equally between the Parties. Responsibility for the fees of the Panel members incurred in connection with a Dispute referred to such Panel pursuant to this Section 5 of this Schedule 25 shall be determined by such Panel and shall be aligned with the determination of the Dispute by such Panel.

v. In the event of death, resignation, disqualification, inability or refusal to act by one of the members of either Panel, a new member of the Panel shall be appointed by the Person(s) who appointed the original member within 10 Working Days of the occurrence of such event.

d. The Parties shall initially establish each Panel by each appointing a member pursuant to Section 5.c.ii of this Schedule 25 no later than 15 Working Days following NTP1.

e. The Persons initially selected to comprise the Technical Panel shall comprise such Panel until such Panel is re-established following the Final Acceptance Date pursuant to Section 5.f of this Schedule 25 unless such Panel is dissolved or reconstituted earlier in accordance with Section 5.t of this Schedule 25.

f. Promptly following the Final Acceptance Date, the Parties shall re-establish the Technical Panel by each appointing a member pursuant to Section 5.c.ii of this Schedule 25 no later than 60 Calendar Days following the Final Acceptance Date. Following completion of this appointment process, the previously existing Technical Panel shall be automatically dissolved (provided that such dissolution shall be delayed until it renders its decision on any Dispute then pending before it).

g. A Dispute is referred to an appropriate Dispute Resolution Panel by, and on the date of, service of a notice of reference to such Dispute Resolution Panel by the referring Party upon the other Party. Such service of notice shall include:

   i. an initial concise summary of the nature and background of the Dispute, of the facts relevant to the Dispute and of the issues to be decided;

   ii. an initial statement of the relief (including any compensation) which the referring Party is seeking; and

   iii. any reasonable request for the Dispute Resolution Panel to consider, or not consider, such Dispute together with any other previously or simultaneously submitted Dispute.

h. A copy of such notice of reference shall also be served by the referring Party or, as applicable, the referring Panel (where a Panel makes a reference in accordance with Section 5.b of this Schedule 25) upon the Chairperson of the applicable Dispute Resolution Panel. Each Party shall be entitled within 10 Working Days following the notice of reference, to deliver to the applicable Panel:

   i. a concise summary of the nature and background of the Dispute, of the facts relevant to the Dispute and of the issues to be decided;

   ii. if applicable, a statement of the relief (including any compensation) which such Party is seeking;

   iii. copies of correspondence, reports and such other documents to which the Party wishes to refer or upon which it relies; and

   iv. any reasonable request for the Dispute Resolution Panel to consider, or not consider, such Dispute together with any other previously or simultaneously submitted Dispute.

i. Each Party shall promptly deliver such other information as the Dispute Resolution Panel(s) may from time to time reasonably require for the purposes of resolving the Dispute.

j. Subject to Section 5.k of this Schedule 25, each Dispute Resolution Panel shall fix its own rules of procedure, either generally or on an ad hoc basis, and shall notify the Parties of such rules of procedure.

k. Each Dispute Resolution Panel shall have the following powers:

   i. the Chairperson of the Dispute Resolution Panel shall decide whether or not to convene a hearing or otherwise to take oral evidence or whether the Panel shall determine the Dispute on a documents-only basis;

   ii. the Chairperson may order the evidence of a witness to be presented in written form by way of a signed statement and may order the production of any drawing, certificate, specification, report, study, written information and data and any other document (including a record of such document in digital form) (or copies thereof) in the possession of any Party; and

   iii. the Chairperson of the Technical Panel may request any samples of materials to be taken and analyzed or tests to be made on site by experts.

l. Unless a Dispute Resolution Panel decides otherwise, the Chairperson shall fix the date, time and place of any hearing (which shall be in the State) before such Dispute Resolution Panel and the rules of procedure of the hearing, identify the Dispute(s) (or relevant parts thereof) to be considered at such hearing (taking into consideration any Party's request made pursuant to Sections 5.b, 5.g.iii or 5.h.iv of this Schedule 25) and shall require the attendance of the Parties. Each Party may appear before such Dispute

Resolution Panel accompanied by or represented by technical, financial or other relevant consultants (excluding, for certainty, representation before such Panel by legal counsel).

m. In determining any Dispute referred to it, each Dispute Resolution Panel shall act fairly and impartially as between the Parties, giving each Party a reasonable opportunity of presenting its case and responding to the case of the other Party, and shall adopt procedures appropriate to the circumstances of the particular case avoiding unnecessary delay, so as to provide a fair and expeditious means for determination of the Dispute.

n. All decisions of each Dispute Resolution Panel shall be made, and notified in writing (with reasons for the decision) to the Parties, as soon as possible but in any event no later than 60 Calendar Days (or such other period of time as the Parties may agree in writing) following the later of (i) the Dispute being referred and (ii) the constitution of the relevant Dispute Resolution Panel(s) pursuant to Section 5.c.ii and Section 5.c.iii) of this Schedule 25. Every Dispute Resolution Panel decision shall identify the specific issues to which it relates and the bases for such decision, and state whether it is a unanimous decision of the Dispute Resolution Panel. In the event of lack of unanimity, reasons for any dissenting opinion shall be given. Unless subsequently incorporated into a settlement agreement entered into by the Parties pursuant to Section 5.r of this Schedule 25, a Dispute Resolution Panel decision shall not toll any statute of limitations or otherwise limit the time within which any Party may avail itself of any remedy under Law or contract.

o. Within 10 Working Days of being notified of such decision, Developer shall notify the Enterprises if it intends to accept or reject such decision (in whole or in part), and the Enterprises shall, within 10 Working Days after receipt of Developer's notification, likewise notify Developer if they intend to accept or reject such decision (in whole or in part). Any such notice of intention by either Party shall be considered a non-binding indication of intent with respect to potential settlement or further Dispute resolution proceedings

p. If a Dispute Resolution Panel fails to notify its decision to the Parties within the 60 Calendar Day (or such other) period referred to in Section 5.n of this Schedule 25, such Dispute Resolution Panel shall be deemed to have failed to reach a decision in the matter. Any decision of a Dispute Resolution Panel notified to the Parties after the expiry of such 60 Calendar Day (or such other) period shall be ineffective unless the Parties mutually agree otherwise in writing.

q. Upon the earliest of:

   i. expiry of such 60 Calendar Day (or such other) period without a notification of a decision by a Dispute Resolution Panel to the Parties;

   ii. the Enterprises' delivery of a notice to Developer pursuant to Section 5.o of this Schedule 25; and

   iii. the expiry of the relevant time period set out in Section 5.o of this Schedule 25 without the Enterprises having delivered a notification to Developer pursuant thereto,

   either Party may refer the Dispute for court resolution in accordance with Section 37 of the Project Agreement.

r. The Parties may, at any time following notification of a decision by a Dispute Resolution Panel or otherwise, memorialize settlement of the Dispute by executing a written memorandum or similar document in a form to be prepared by the Enterprises (unless the Enterprises otherwise delegate such preparation to Developer, in which case Developer shall prepare such memorandum or document) setting out the details of such settlement, and such document shall be considered a binding settlement agreement.

s. Subject to Section 4.b of this Schedule 25, decisions of a Dispute Resolution Panel are admissible in subsequent proceedings but shall be prefaced with the following statement:

"This decision may be taken under consideration with the understanding that: (1) The Dispute was a mediation proceeding based on presentations by the Parties. (2) The Parties were not represented by legal counsel in front of the Dispute Resolution Panel(s). (3) No fact or expert witnesses presented sworn testimony or were subject to cross-examination. (4) The Parties to the Dispute Resolution Panel(s) were not provided with the right to any discovery, such as production of documents or depositions. (5) There is no record of any Dispute Resolution Panel hearing other than the written decision."

t. Each of the Technical Panel and the Commercial Panel shall be dissolved on mutual agreement between the Parties, provided that new Dispute Resolution Panel(s) may be constituted by the Parties at any time thereafter (and shall be constituted pursuant to Section 5.c.ii and Section 5.c.iii of this Schedule 25 in the event of a Dispute), in which case the provisions of this Schedule 25 shall apply as to its or their appointment, constitution and functioning (except in relation to the period of its or their appointment, which shall be decided in each case by the Parties).

u. Neither Dispute Resolution Panel shall be deemed to be arbitrators, but both shall render their decisions as experts.

6. **No Joinder**

No proceedings to resolve any Dispute arising out of or relating to the Project Agreement shall include, by consolidation or joinder or in any other manner, any additional Person, including any Principal Subcontractor or Subcontractor, not a Party to the Project Agreement, except with the written consent of each Party and any other Person sought to be so joined.

7. **Equitable Relief**

Subject to Section 37.1.a of the Project Agreement, either Party shall be entitled to seek equitable relief in respect of any Dispute before the United States District Court of Colorado or State District Court of Colorado for the City and County of Denver at any time after the conclusion of the 15 Working Day period referred to in Section 2.a of this Schedule 25 (or such longer period as is mutually agreed by the Parties).

8. **Continuation of Work**

During the course of resolving any Dispute pursuant to this Schedule 25 and the Project Agreement, Developer will continue with the Work (including any Work that is the subject of the Dispute) in accordance with the Project Agreement.

9. **Costs of Dispute Resolution**

Each Party shall bear its own costs and expenses, including attorneys' fees, in any Dispute arising out of the Project Agreement, except as expressly provided therein or pursuant to the terms of any binding Dispute resolution.

Schedule 26
Base Financial Model

Attached in digital format.

Schedule 27
Key Personnel

Project Manager

Position Description: Responsible for overall execution and administration of Developer's responsibilities for the Project, with authority to bind Developer on all matters delegable pursuant to Law and Developer's governing documents affecting Project execution and administration, including: (i) with respect to design, construction, commissioning, operations, and maintenance; and (ii) authority to suspend Work.

Qualifications: The Project Manager shall have demonstrated experience and expertise on a similar role in the delivery of projects similar in scope, value, nature, and complexity to the Project.

Minimum Period of Availability: From Agreement Date to the end of the Term.

To be seconded to/employed by: Developer

Name: Chris Hodgkins

Construction Manager

Position Description: Responsible for ensuring that the Project is constructed in accordance with all requirements of this Agreement. Responsible for managing Construction Contractor's construction personnel, scheduling of the construction quality assurance personnel, and administering compliance with all Technical Requirements applicable to the Construction Work. The Construction Manager shall have the authority to suspend Construction Work.

Qualifications: The Construction Manager shall have a minimum of 15 years' experience in construction and management of construction on highway projects similar in scope, value, nature, and complexity to the Project, with an emphasis on design-build experience and experience with interstate highways and interstate bridges.

Minimum Period of Availability: From Agreement Date to Final Acceptance.

To be seconded to/employed by: Construction Contractor

Name: Barry Thoendel

Design-Build Manager

Position Description:	Responsible for the overall design and construction of the Project and for managing Developer's design-build team. The Design-Build Manager shall: (i) ensure that the Project is designed and constructed in accordance with the Technical Requirements; and (ii) have authority to suspend Construction Work.
Qualifications:	The Design-Build Manager shall have a minimum of 20 years' experience, including a minimum of 15 years' design-build experience, in construction and management of design and construction on highway projects that included work of a similar scope, value, nature, and complexity as included in the Project.
Minimum Period of Availability:	From Agreement Date to Final Acceptance.
To be seconded to/employed by:	Construction Contractor
Name:	Tom Howell

Design Manager

Position Description:	Responsible for: (i) ensuring that the overall Project design is completed and design criteria requirements are met; (ii) managing the design team's personnel; and (iii) administering all design requirements in this Agreement. The Design Manager shall have authority to suspend design Work.
Qualifications:	The Design Manager shall be a professional engineer licensed in the State no later than the date of issuance of NTP1. The Design Manager shall have a minimum of 15 years' experience in managing design for multidisciplinary highway projects with similar scope, value, nature, and complexity to the Project, with emphasis on design-build experience and experience with interstate highway, interstate bridges, and projects of similar scope, value, nature, and complexity to the Project.
Minimum Period of Availability:	From Agreement Date to Final Acceptance.
To be seconded to/employed by:	Principal Design Work Subcontractor to the Construction Contractor
Name:	Doug Andrew

O&M Manager

Position Description: Responsible for ensuring that all O&M Work and (at Developer's election) Renewal Work requirements of this Agreement are met.

Qualifications: The O&M Manager shall have demonstrated experience and expertise in a similar role on managing the operations, maintenance and (at Developer's election) rehabilitation work on highway projects of similar scope, value, nature, and complexity to the Project.

Minimum Period of Availability: From Agreement Date to the end of the Term.

To be seconded to/employed by: O&M Contractor

Name: Abe Henningsgaard

Project Quality Manager

Position Description: Responsible for overall quality management of the Project. The Project Quality Manager shall have the authority to suspend Work and shall provide monthly certification that Work is being performed in compliance with Law and the Project design.

Qualifications: The Project Quality Manager shall be a professional engineer licensed in the State no later than the date of issuance of NTP1, and shall have a minimum of eight years' experience in infrastructure transportation project design and construction, including at least five years' experience in quality assurance activities, including the preparation and implementation of quality plans and procedures for design, construction, and operations on transportation projects that included work of a similar scope, value, nature, and complexity to the Project.

Minimum Period of Availability: From Agreement Date to the end of the Term.

To be seconded to/employed by: The Project Quality Manager shall be employed by Developer. The Project Quality Manager can hold only this Key Personnel position.

Name: Gordon Peterson

Independent Design Quality Manager

Position Description:	Responsible for ensuring quality management on all Design Work carried out on the Project, the Independent Design Quality Manager shall have the authority to suspend Work.
Qualifications:	The Independent Design Quality Manager shall be a professional engineer licensed in the State no later than the date of issuance of NTP1, and shall have a minimum of eight years' experience in highway design, including at least five years' experience in quality assurance activities, including the preparation and implementation of quality plans and procedures for design on highway projects that included work of a similar scope, value, nature, and complexity to the Project.
Minimum Period of Availability:	From Agreement Date to Final Acceptance.
To be seconded to/employed by:	The Independent Design Quality Manager shall be employed by the Principal Design Work Subcontractor to the Construction Contractor.
Name:	James Rozek

Construction Process Control Manager

Position Description:	Responsible for ensuring all methods and procedures contained in the approved Stage 2 QMP are carried out on the Project, the Construction Process Control Manager shall have authority to suspend Work.
Qualifications:	The Construction Process Control Manager shall be a professional engineer licensed in the State or possess a National Institute for Certification of Engineering Technologies (NICET) Level III Certificate in Highway Materials or Construction Materials with the soil, concrete, and asphalt sub-fields, as well as have or obtain the American Society for Quality (ASQ) certification as a quality inspector, quality engineer, or manager of quality, in each case prior to the date of issuance of NTP2. The Construction Process Control Manager shall have a minimum of eight years' highway construction experience on projects that included work of a similar scope, value, nature, and complexity to the Project.
Minimum Period of Availability:	From Agreement Date to the second anniversary of Final Acceptance.
To be seconded to/employed by:	Construction Contractor
Name:	Sean McAfee

Independent Quality Control Manager

Position Description:	Responsible for managing all independent Quality Control aspects contained in the approved Stage 2 QMP that are carried out on the Project, including having authority to suspend Work.
Qualifications:	The Independent Quality Control Manager shall be a professional engineer licensed in the State no later than the date of issuance of NTP1, and shall have a minimum of eight years' experience in transportation construction on projects that included work of a similar scope, value, nature, and complexity to the Project, five years of which shall be experience in developing and implementing similar quality control programs on transportation projects. The Independent Quality Control Manager shall have or obtain the American Society for Quality (ASQ) certification as a quality inspector, quality engineer, or manager of quality prior to the date of issuance of NTP2.
Minimum Period of Availability:	From Agreement Date to the second anniversary of Final Acceptance.
To be seconded to/employed by:	The Independent Quality Control Manager shall be employed by the Developer.
Name:	Tracy Martin

Environmental Manager

Position Description:	The Environmental Manager is responsible for ensuring compliance with all Environmental Requirements and commitments. The Environmental Manager shall have authority to suspend Work.
Qualifications:	The Environmental Manager shall have a minimum of seven years' progressive experience working on projects of similar scope, value, nature, and complexity to the Project. The Environmental Manager shall also demonstrate the ability to work effectively with both design and construction staff.
Minimum Period of Availability:	From Agreement Date to the second anniversary of Final Acceptance.
To be seconded to/employed by:	Developer
Name:	Jenn Bradtmueller

Utilities Manager

Position Description:	Responsible for managing all required Utility Work and coordinating the same with Utility Owners.
Qualifications:	The Utilities Manager is a management role with a minimum of five years' relevant experience on major infrastructure projects of similar scope, value, nature and complexity to the Project.
Minimum Period of Availability:	From Agreement Date to Final Acceptance.
To be seconded to/employed by:	Construction Contractor
Name:	Kevin Custy

Project Communications Manager

Position Description:	Responsible for overseeing all Developer communications efforts during construction, operations, and maintenance.
Qualifications:	The Project Communications Manager shall have: (i) a minimum of seven years' professional experience working on design-build construction projects and a practical understanding of construction schedules, MOT plans, and work performance processes; (ii) experience with, and understanding of, complexities and importance of maintaining good relationships between the Project and government, businesses, residents, the general public, and other stakeholders; and (iii) experience with implementing communication and public involvement plans on projects of similar scope, value, nature, and complexity to the Project.
Minimum Period of Availability:	From Agreement Date to the end of the Term.
To be seconded to/employed by:	Developer
Name:	Hunter Sydnor

Schedule 28
Proposal Extracts

Part A: Proposal Extracts

[*Intentionally not used*.]

Part B: ATC Modifications

1. Subject to, and with effect from the date of, Developer's satisfaction and compliance with the applicable conditions set forth in Section 2 of this Part B of this Schedule 28 (*Proposal Extracts*), the Project Agreement shall be modified as follows (each of the following (a) through (i), an "ATC Modification"):

   (a) as the "ATC 11.2 Modifications", Contract Drawing 10B.10.13.01 of Schedule 10B (*Contract Drawings*) of the Project Agreement shall be modified as shown in Exhibit A to this Part B of this Schedule 28 (*Proposal Extracts*);

   (b) as the "ATC 12.2 Modifications":

      (i) Section 8.4.9.f of Schedule 10 (*Design and Construction Requirements*) shall be modified by deleting the words "with a structure over the Lowered Section"; and

      (ii) Contract Drawing 10B.10.13.01 shall be modified as shown in Exhibit B to this Part B of this Schedule 28 (*Proposal Extracts*);

   (c) as the "ATC 14.2 Modifications":

      (i) Contract Drawing 10B.10.9.01 shall be modified as shown in Exhibit C to this Part B of this Schedule 28 (*Proposal Extracts*); and

      (ii) Contract Drawing 10B.10.13.01 shall be modified as shown in Exhibit D to this Part B of this Schedule 28 (*Proposal Extracts*);

   (d) as the "ATC 17.1 Modifications":

      (i) Section 10.1.2.b.i of Schedule 10 (*Design and Construction Requirements*) shall be modified by replacing such Section in its entirety with the following:

      "100% temporary and permanent trackwork design and construction phasing for the UPRR Crossing (100% UPRR Trackwork Plans and Specifications) which the Developer shall not be permitted to amend without the UPRR's prior written approval"; and

      (ii) Section 10.1.2.e of Schedule 10 (*Design and Construction Requirements*) shall be modified by replacing such Section in its entirety with the following:

      "The Department shall pay UPRR directly for their trackwork, ballast and Railroad signalization work, except that the Developer shall reimburse the Department for any increase in the costs and expenses of all such work that the Department is required to pay to UPRR pursuant to the terms of the UPRR RRA to the extent that the increase is attributable to any changes in the 100% Trackwork Plans and Specifications referred to in Section 10.1.2.b.i as attached to the UPRR RRA as at the execution date thereof. The Developer shall pay for all other costs of the UPRR Work (including associated flagging costs) directly to UPRR. Cost responsibilities of the Department to UPRR are further identified in the UPRR RRA included in the Reference Documents.";

   (e) as the "ATC 18.1 Modifications":

      (i) Appendix A (*Roadway Design Criteria*) to Section 9 of Schedule 10 (*Design and Construction Requirements*) shall be modified as indicated by the notes to such Appendix that reference the ATC 18.1 Modifications;

      (ii) Contract Drawing 10B.10.9.01 shall be modified as shown in Exhibit E to this Part B of this Schedule 28 (*Proposal Extracts*); and

      (iii) Contract Drawing 10B.10.13.01 shall be modified as shown in Exhibit F to this Part B of this Schedule 28 (*Proposal Extracts*);

(f) as the "ATC 28.1 Modifications":

(i) Appendix A (*Roadway Design Criteria*) to Section 9 of Schedule 10 (*Design and Construction Requirements*) shall be modified as indicated by the notes to such Appendix that reference the ATC 18.1 Modifications;

(ii) Contract Drawing 10B.10.9.01 shall be modified as shown in Exhibit G to this Part B of this Schedule 28 (*Proposal Extracts*); and

(iii) Contract Drawing 10B.10.13.01 shall be modified as shown in Exhibit H to this Part B of this Schedule 28 (*Proposal Extracts*);

(g) as the "ATC 37.2 Modifications":

(i) Section 12.18.2.c of Schedule 10 (*Design and Construction Requirements*) shall be modified by replacing such Section in its entirety with the following:

"The main electrical distribution shall be configured, interconnected, and controlled to allow all services to the Cover to remain operational in the event of a utility power supply transformer failure at the end of the Cover.", and

(ii) Section 12.18.3.e of Schedule 10 (*Design and Construction Requirements*) shall be modified by replacing such Section in its entirety with the following:

"e. Emergency Power UPS System

i. Single UPS system shall be provided within the emergency electrical room. UPS system shall jointly serve the lighting system and the remaining safety critical plant.

ii. The UPS system specification shall be developed and submitted to the Department for Acceptance, based on the following:

A. Three-phase, on-line, double-conversion, static-type, UPS units with battery autonomy at least long enough to safely shut down the tunnel in the event that the generator does not start;

B. 20% Spare capacity;

C. N+1 parallel redundant configuration; and

D. External wraparound bypass unit.";

(h) as the "ATC 66.0 Modifications", Section 12.13.10 of Schedule 10 (*Design and Construction Requirements*) shall be modified by replacing such Section in its entirety with the following:

"Monitoring equipment shall be provided for the continuous monitoring of air quality, in the Cover and:

a. At a minimum, sensors shall be provided to measure CO, visibility, and NO2 within the Cover in each direction of travel, and there shall be a back-up sensor for each quantity being measured (i.e. minimum of four sensors, assuming one self-contained sensor can measure CO, visibility, and NO2).

b. Sensors to measure airspeed, air flow direction and temperature (in each case, both inside and outside of the Cover) shall be provided.

c. For pollution monitoring, a logical method for control shall be developed for normal, maintenance and congested operations and to safeguard the fans from frequent switching;

d. Pollutant and visibility monitors shall be located adjacent to the traffic lanes in the Cover, at locations where the worst level is anticipated. The location of sampling points shall avoid dilution by air circulation from the Portals;

e. All monitoring equipment shall be calibrated to represent the average air quality for a 15-minute rolling average within the Cover;

f. Monitoring system shall be provided to facilitate operational data to be recorded and stored for analysis. Data to be recorded shall include pollution levels (at least CO, visibility and NO2), Cover air speed, fan operations, alarm states, air speed director and temperature;

g. Monitoring stations shall be located and configured so as to provide data to drive the VCS for the management of pollutants in the Cover to acceptable limits;

h. Monitoring equipment shall not be installed near to jet fan inlets and outlets so as to affect the performance of the CVS; and

i. The Developer shall provide analysis of anticipated air quality quantities in the Cover (CO, visibility, NO2, air speed, air flow direction, temperature) under peak hour flowing traffic, fully congested conditions (stopped traffic) with and without an external wind blowing. For each scenario the Developer shall use the analysis to compute the worst pollution level likely and to demonstrate that the monitoring equipment will provide adequate notification to prevent air quality criteria being violated.";

(i) as the "ATC 68.0 Modifications":

(i) Section 8.4.9.b.ii of Schedule 10 (*Design and Construction Requirements*) shall be modified by replacing such Section in its entirety with the following:

"Without prejudice to the generality of any other provision of the Project Agreement (including this Schedule 10), and subject to the rights of the Developer arising as a result of the occurrence of any Developer Change documented in a Change Order or any Supervening Event, the Developer shall bear all risk of delay and/or all risk of cost and expense for any work related to any Utility (whether or not such work constitutes Utility Work and/or is work performed by the Developer) that is required to enable it to comply with its obligations under this Section 8.4.9.b.";

(ii) the references in Table 8-5 in Section 8 of Schedule 10 (*Design and Construction Requirements*) with respect to the "Onsite North" pond to "Race Court and Brighton Boulevard" in the "I-70 Mainline Station" column and to the "Water Quality and Detention Pond" in the "Facility Type" column shall be modified by replacing such references in their entirety with, respectively, references to "46th Avenue North and York Street" in the "I-70 Mainline Station" column and to the "Water Quality Pond" in the "Facility Type" column; and

(iii) Contract Drawing 10B.10.18.02 of Schedule 10B (*Contract Drawings*) of the Project Agreement shall be deleted and treated as no longer used; and

(j) as the "ATC 71.0 Modifications", Section 12.20.3.b of Schedule 10 (*Design and Construction Requirements*) shall be modified by replacing such Section in its entirety with the following:

"Isolation valves shall be provided between hose valve stations to enable sections of the system to be shut down for maintenance without shutting the entire system down. Standpipe hose connection stations shall be located along the center wall of each bore and at each cross bore door, in each bore, located adjacent to the door."

2. As between the Enterprises and Developer, and without limiting any other obligation of Developer under the Project Agreement, Developer shall perform all necessary actions and shall bear all risk of delay and/or all risk of cost and expense (including by way of reimbursement to the Enterprises) as necessary to satisfy all applicable conditions set out in "Column A" of the table below (each, an "ATC Condition") necessary to implement the ATC (as defined in the ITP) that is the subject of the corresponding ATC Modification(s) referenced in "Column B" of the table below.

Column A **(ATC Conditions)**	**Column B** **(corresponding ATC Modification(s))**
(a) In accordance with Sections 8.4.2.a and 8.4.3.b of the Project Agreement, obtaining, modifying, renewing or extending any and all necessary Governmental Approvals and Permits, including (i) from the UPRR with respect to the ATC 17.1 Modifications, (ii) from any AHJ with respect to the ATC 37.2 Modifications and the ATC 71.0 Modifications and (iii) from the City of Denver Department of Environmental Health with respect to the ATC 66.0 Modifications.	ATC 11.2 Modifications ATC 12.2 Modifications ATC 14.2 Modifications ATC 17.1 Modifications ATC 18.1 Modifications ATC 28.1 Modifications ATC 37.2 Modifications ATC 66.0 Modifications ATC 68.0 Modifications ATC 71.0 Modifications
(b) Acquiring and maintaining any Additional ROW Parcels, any Temporary Properties, and any Permit Areas.	ATC 11.2 Modifications ATC 17.1 Modifications ATC 12.2 Modifications
(c) Following completion of final design, applying for and obtaining a technical variance from the City of Denver.	ATC 18.1 Modifications

3. If at any time Developer is unable to satisfy, or is no longer able to satisfy, any ATC Condition with respect to any applicable ATC Modification:

   (a) Developer shall notify the Enterprises of such inability within 10 Working Days of determining that it is unable to satisfy, or no longer able to satisfy, any such ATC Condition;

   (b) pursuant to Section 8.2.3 of the Project Agreement, Developer shall thereafter comply with the requirements of the Project Agreement without giving effect to the applicable ATC Modification and without any resulting entitlement to an extension of time, relief and/or compensation; and

   (c) Developer shall continue to bear all risk of delay and/or all risk of cost and expense (including by way of reimbursement to the Enterprises) for having sought to satisfy any such ATC Condition or otherwise sought to proceed with such ATC Modification.

4. Upon and subject to delivery by Developer of a notice pursuant to Section 3(a) of this Part B of this Schedule 28 (*Proposal Extracts*) with respect to an inability to satisfy any ATC Condition with respect to the ATC 68.0 Modifications, the parcels listed in Exhibit I to this Part B of this Schedule 28 (*Proposal Extracts*) shall be added as ROW Parcels to the table set out in Appendix A to Schedule 18 (*Right-of-Way*).

Exhibit A
ATC 11.2 Modifications

Attached in digital format.

Exhibit B
ATC 12.2 Modifications

Attached in digital format.

Exhibit C
ATC 14.2 Modifications

Attached in digital format.

Exhibit D
ATC 14.2 Modifications

Attached in digital format.

Exhibit E
ATC 18.1 Modifications

Attached in digital format.

Exhibit F
ATC 18.1 Modifications

Attached in digital format.

Exhibit G
ATC 28.1 Modifications

Attached in digital format.

Exhibit H
ATC 28.1 Modifications

Attached in digital format.

Exhibit I
ATC 68.0 Modifications

Parcel # (In Fee Unless shown as Partial and/or TEs)	Design Section	DEPT = Department DEV = Developer ACQ = Acquisition PM = Property Mgmt.	Owner	Area of Partial Acquisition (Square Feet)	Date First Available for Possession
PE-26A (partial)	Brighton Boulevard To Quebec St. (Onsite Outfall)	DEPT – ACQ DEV – PM	UPRR	4,248	18 Months after Written Notice from Developer to Department for Acquisition (needed for Onsite Outfall System)
PE-136C (Partial)	Brighton Boulevard to Colorado Boulevard (Onsite Outfall)	DEPT – ACQ DEV – PM	DRIRR	554	18 Months after Written Notice from Developer to Department for Acquisition (needed for Onsite Outfall System)
PE-35 (Partial)	Brighton Boulevard to Colorado Boulevard (Onsite Outfall)	DEPT – ACQ DEV – PM	E&S Real Estate LLC	13,950	18 Months after Written Notice from Developer to Department for Acquisition (needed for Onsite Outfall System)
PE-36 (Partial)	Brighton Boulevard to Colorado Boulevard (Onsite Outfall)	DEPT – ACQ DEV – PM	BNSF	4,200	18 Months after Written Notice from Developer to Department for Acquisition (needed for Onsite Outfall System)

Parcel # (In Fee Unless shown as Partial and/or TEs)	Design Section	DEPT = Department DEV = Developer ACQ = Acquisition PM = Property Mgmt.	Owner	Area of Partial Acquisition (Square Feet)	Date First Available for Possession
PE-37 (Partial)	Brighton Boulevard to Colorado Boulevard (Onsite Outfall)	DEPT – ACQ DEV – PM	G&K Services Inc., owner	30,250	18 Months after Written Notice from Developer to Department for Acquisition (needed for Onsite Outfall System)
RW-38 (Partial)	Brighton Boulevard to Colorado Boulevard (Onsite Outfall)	DEPT – ACQ DEV – PM	Versacold USA, Inc.	93,800	18 Months after Written Notice from Developer to Department for Acquisition (needed for Onsite Outfall System)
PE-39 (Partial)	Brighton Boulevard to Colorado Boulevard (Onsite Outfall)	DEPT – ACQ DEV – PM	Middleton Properties LLC	12,820	18 Months after Written Notice from Developer to Department for Acquisition (needed for Onsite Outfall System)
PE-40 (Partial)	Brighton Boulevard to Colorado Boulevard (Onsite Outfall)	DEPT – ACQ DEV – PM	Rockyn Lazy L Land LLC	13,050	18 Months after Written Notice from Developer to Department for Acquisition (needed for Onsite Outfall System)

Parcel # (In Fee Unless shown as Partial and/or TEs)	Design Section	DEPT = Department DEV = Developer ACQ = Acquisition PM = Property Mgmt.	Owner	Area of Partial Acquisition (Square Feet)	Date First Available for Possession
PE-197 (Partial)	Brighton Boulevard to Colorado Blvd. (Onsite Outfall)	DEPT – ACQ DEV – PM	KAI IWI Investments, LLC	11,300	18 Months after Written Notice from Developer to Department for Acquisition (needed for Onsite Outfall System)
PE-200 (Partial)	Brighton Boulevard to Colorado Blvd. (Onsite Outfall)	DEPT – ACQ DEV – PM	BH Partnership B LP	400	18 Months after Written Notice from Developer to Department for Acquisition (needed for Onsite Outfall System)

Exhibit J
ATC 30.1 Modifications

Attached in digital format.

Exhibit K
ATC 38.0 Modifications

Attached in digital format.

Schedule 29
Reference Documents

1. REFERENCE DOCUMENTS

Availability Legend

NS = Document not supplied

S = Document supplied

Date Issued: Date the document was listed or supplied

Table 1 Reference Documents

Doc #	Document	Date Issued	Availability
1	**Financial Close**		
29.1.01	Central 70 Project Intra-Agency Agreement	11/15/2017	S
4	**Payments**		
29.4.01	CBE Central 70 2010 Supplemental Trust Indenture	4/18/2017	S
29.4.02	CBE Central 70 2017 Supplemental Trust Indenture	7/07/2017	S
29.4.03	Central 70 Master Trust Indenture	4/18/2017	S
8	**Project Administration**		
29.8.01	CCD Permit Procedure	2/10/2017	S
9	**Submittals**		
29.9.01	CCD Statement of No Objection (SONO)	6/14/2016	S
29.9.02	Central 70 CDOT & CCD Coordination Memorandum	3/22/2017	S
10.2	**Maintenance of Traffic**		
29.10.2.01	2012, 2021, and 2035 Synchro and FREEVAL Models	7/13/2016	S
29.10.2.02	Traffic Data	8/05/2016	S
10.3	**ITS and Tolling Equipment**		
29.10.3.01	Central 70 Concept of Operations	4/18/2017	S
29.10.3.02	ITS Infrastructure Details	10/27/2016	S
29.10.3.03	Tolling Service Agreement by HPTE and E470	11/06/2015	S

Doc #	Document	Date Issued	Availability
29.10.3.04	Existing ITS Infrastructure Data	10/27/2016	S
29.10.3.05	Central 70 ITS Integration and Testing Plan	12/22/2016	S
29.10.3.06	Ramp Metering Details	2/23/2016	S
29.10.3.07	Ramp Metering Plans	3/06/2017	S
10.4	**Utilities**		
29.10.4.01	Utility Owner Contact List	3/06/2017	S
29.10.4.02	Utility Matrix	4/18/2017	S
29.10.4.03	Potholing Logs	4/18/2017	S
29.10.4.04	Preliminary Utility Plans	3/06/2017	S
29.10.4.05	Utility Owner Mapping Files	3/06/2017	S
29.10.4.06	Meeting Minutes	3/06/2017	S
29.10.4.07	Miscellaneous	4/18/2017	S
29.10.4.08	Utility Relocation Agreements	9/08/2017	S
29.10.4.09	Existing Utility Model I-25 to Tower Road	3/06/2017	S
29.10.4.10	Proposed Utility Model I-25 to Tower Road	3/06/2017	S
29.10.4.11	Utility Easements	11/18/2016	S
29.10.4.12	Shared Resource Agreements	10/27/2016	S
29.10.4.13	Identification of Interstate ROW and Utilities	10/27/2016	S
29.10.4.14	Early Utility Relocations	4/18/2017	S
10.5	**Survey**		
29.10.5.01	I-70 InRoads DTM I-25 to Sand Creek	9/29/2015	S
29.10.5.02	I-70 InRoads DTM Sand Creek to Airport Road	9/29/2015	S
29.10.5.03	Lidar Inroads DTM of UPRR Yard and 46th Ave Brighton to Garfield St (under Viaduct)	2/23/2016	S
29.10.5.04	I-70 InRoads DTM (Onsite Outfall Area)	9/29/2015	S
29.10.5.05	Planimetrics Mapping I-25 to Sand Creek and Storm Drain Outfalls	9/29/2015	S

Doc #	Document	Date Issued	Availability
29.10.5.06	Planimetrics Mapping and 3D Breaklines Sand Creek to Airport Road	9/29/2015	S
29.10.5.07	Lidar Planimetrics Mapping of UPRR Yard and 46th Ave Brighton to Garfield St (under viaduct)	9/29/2015	S
29.10.5.08	Planimetrics Mapping OnSite Outfall Area (supplemental)	9/29/2015	S
29.10.5.09	3D Breaklines I-25 to Sand Creek and Storm Drain Outfalls	9/29/2015	S
29.10.5.10	3D Breaklines UPRR Yard and 46th Ave: Brighton to Garfield St (under Viaduct)	9/29/2015	S
29.10.5.11	Utility Locates Survey Brighton to Sand Creek and Storm Drain Outfalls	9/29/2015	S
29.10.5.12	Storm and Sanitary Manhole Survey Brighton to Sand Creek and Storm Drain Outfalls	2/23/2016	S
29.10.5.13	Utility Locates Survey Sand Creek to Airport Road	9/29/2015	S
29.10.5.14	Storm and Sanitary Manhole Survey Sand Creek to Airport Road	9/29/2015	S
29.10.5.15	Existing Contours I-25 to Sand Creek and Storm Drain Outfalls	9/29/2015	S
29.10.5.16	Existing Contours Sand Creek to Airport Road	9/29/2015	S
29.10.5.17	Aerial Image I-25 to I-270	9/29/2015	S
29.10.5.18	Aerial Image I-270 to Tower Road	9/29/2015	S
29.10.5.19	CDOT Interstate 70 East Viaduct Horizontal and Vertical Control Survey Report for Aerial Mapping Volume 1	9/29/2015	S
29.10.5.20	CDOT Interstate 70 East Viaduct Horizontal and Vertical Control Survey Report for Aerial Mapping Volume 2	9/29/2015	S
29.10.5.21	Boring and Monitoring Well Locations	4/18/2017	S
29.10.5.22	Supplemental Topographic Survey	2/03/2017	S
29.10.5.23	Lidar InRoads DTM UPRR Track Bridge	2/23/2016	S
29.10.5.24	LIDAR Data (Point Clouds)	6/14/2016	S

Doc #	Document	Date Issued	Availability
29.10.5.25	Swansea Improvement Survey Plat	6/14/2016	S
29.10.5.26	Land Survey Control Diagram	10/6/2017	S
10.6	**Roadway Pavements**		
29.10.6.01	FINAL Preliminary Subsurface Investigation Report I-70 East Corridor Project Partial Cover Lowered Alternative with Managed Lanes Option Brighton Boulevard to Chambers Road	4/25/2017	S
29.10.6.02	Preliminary Subsurface Investigation Report for Partial Cover Lowered (PCL) Alternative	6/14/2016	S
29.10.6.03	Preliminary Subsurface Investigation Report for Partial Cover Lowered (PCL) Alternative Addendum	6/14/2016	S
29.10.6.04	Subsurface Investigation Supplemental Information	12/22/2015	S
29.10.6.05	Pavement Design Data	4/18/2017	S
29.10.6.06	Groundwater Observations on Select Monitoring Wells and Piezometers	3/06/2017	S
29.10.6.07	Boring Location Plans	4/18/2017	S
29.10.6.08	Improvement of the Geotechnical Axial Design Methodology for Colorado's Drilled Shafts Socketed in Weak Rocks	4/18/2017	S
29.10.6.09	Geotechnical Subsurface Exploration Program Swansea Elementary School Improvements	6/14/2016	S
29.10.6.10	Addendum FINAL Preliminary Subsurface Investigation Report I-70 East Corridor Project Partial Cover Lowered Alternative with Managed Lanes Option Brighton Boulevard to Chambers Road	8/01/2016	S
29.10.6.11	Falling Weight Deflectometer Testing	8/05/2016	S
29.10.6.12	Addendum 3 DRIR and Colorado Blvd Borings FINAL Preliminary Subsurface Investigation Report I-70 East	9/16/2016	S

Doc #	Document	Date Issued	Availability
	Corridor Project Partial Cover Lowered Alternative		
10.7	**Earthwork**		
29.10.7.01	CDOT Online Transportation Information System (OTIS)	9/29/2015	NS
29.10.7.02	Denver IGA Fill Material Location	3/31/2017	S
10.8	**Drainage**		
29.10.8.01	Multi Agency Technical Team (Matt) Memos	2/23/2016	S
29.10.8.02	High Street Outfall & 40th Ave System	9/29/2015	S
29.10.8.03	Final - Hydraulic Design Report for I-70 Over Sand Creek	9/29/2015	S
29.10.8.04	Final Drainage Study for Safeway Distribution Center's North Parking Area at I-70 and Dahlia Street	9/29/2015	S
29.10.8.05	Sand Creek FEMA Models	9/29/2015	S
29.10.8.06	Final Drainage Report for I-70 over Havana Street Design-Build	9/29/2015	S
29.10.8.07	Parkhill Storm PH IV-B Plans	9/29/2015	S
29.10.8.08	CE00024 Parkhill Storm Ph IV-51st-St Paul-Drainage Report	9/29/2015	S
29.10.8.09	Final Drainage Report Central Park Boulevard Interchange with I-70	9/29/2015	S
29.10.8.10	Preliminary Drainage Report Brighton Boulevard Preliminary Design 44th street to Race Court	9/29/2015	S
29.10.8.11	Baranmor Ditch OSP	9/29/2015	S
29.10.8.12	Master Drainage Report	4/18/2017	S
29.10.8.13	Master Water Quality Report	4/18/2017	S
29.10.8.14	Drainage Plans	4/18/2017	S
29.10.8.15	Drainage Calculations and Models	4/18/2017	S
29.10.8.16	Drainage Microstation Files	4/18/2017	S
29.10.8.17	Globeville Landing Outfall Project Phase 1A	9/16/2016	S

Doc #	Document	Date Issued	Availability
29.10.8.18	Globeville Landing Outfall Project Phase 2	9/16/2016	S
29.10.8.19	Preliminary Drainage Report Brighton Boulevard Preliminary Design 29th Street to 44th Street	2/23/2016	S
29.10.8.20	Drainage As-Builts	3/17/2017	S
29.10.8.21	Globeville Phase 3 Drainage Report 1999	3/15/2016	S
29.10.8.22	Drainage Existing Mapping	3/25/2016	S
29.10.8.23	Park Hill Storm Phase V	9/2/2016	S
29.10.8.24	Globeville Landing Outfall Project Phase 3	12/16/2016	S
29.10.8.25	City of Denver Platte-to-Park Drainage Program	3/06/2017	S
29.10.8.27	MS4 Permits	2/17/2017	S
29.10.8.28	Denver Storm Drainage Master Plan Models	2/17/2017	S
29.10.8.29	Combined Model of Offsite Outfall System and 39th Channel	3/24/2017	S
10.9	**Roadway**		
29.10.9.01	Roadway Plans[3]	4/18/2017	S
29.10.9.02	Pedestrian Bridge at 47th Avenue over UPRR Non-Preclusions Area	3/06/2017	S
29.10.9.04	Havana Street Design Build Project RFC Plans	8/22/2016	S
29.10.9.05	As-Builts	7/08/2016	S
29.10.9.06	IGA – CDOT and City and County of Denver	4/25/2017	S
29.10.9.07	Roadway Microstation Files[3]	4/18/2017	S
29.10.9.08	Roadway InRoads Geometry Files	3/06/2017	S
29.10.9.09	Brighton Blvd 29th to 44th	12/22/2015	S
29.10.9.10	FHWA Design Exceptions	4/19/2016	S
29.10.9.11	IGA – CDOT and City and County of Denver (Central Park Boulevard)	6/14/2016	S
29.10.9.12	Central 70 Turning Movement Plans	10/27/2016	S
29.10.9.13	Brighton Blvd 44th to Race	7/08/2016	S

Doc #	Document	Date Issued	Availability
29.10.9.14	National Western Center Master Plan	7/13/2016	S
29.10.9.15	Sidewalk Exhibit[3]	4/18/2017	S
29.10.9.16	National Western Stock Show Non-Preclusion Area 1 Exhibit	3/06/2017	S
29.10.9.17	National Western Stock Show Non-Preclusion Area 2 Exhibit	3/06/2017	S
29.10.9.18	Steele-Vasquez Southern Quadrants Non-Preclusion Exhibit	4/18/2017	S
29.10.9.19	Xcel Regulator Relocation Building Non-Preclusion Exhibit	3/06/2017	S
29.10.9.20	York Street Interim Construction Exhibit	4/18/2017	S
29.10.9.21	Free Right Turn Pedestrian Signing Exhibit	3/06/2017	S
29.10.9.22	Steele St to Colorado Blvd (North) Non-Preclusion Exhibit	4/18/2017	S
10.10	**Railroads**		
29.10.10.01	UPRR Trackwork Plans and Specifications	4/18/2017	S
29.10.10.03	Railroad Agreements	4/25/2017 (BNSF RRA); 10/23/2017 (UPRR RRA, excluding exhibits), 10/31/2017 (UPRR RRA exhibits); 10/23/2017 (DRIR RRA, excluding exhibits), 11/15/2017 (DRIR RRA exhibits)	S
29.10.10.04	Railroad Microstation Files	4/25/2017	S
29.10.10.05	Railroad InRoads Geometry Files	4/18/2017	S
29.10.10.06	UPRR Pepsi Lead Crossing Plans	4/25/2017	S
29.10.10.07	DRIR Crossing Plans	1/06/2017	S

Doc #	Document	Date Issued	Availability
29.10.10.08	UPRR Correspondence Comments and Miscellaneous	6/14/2016	S
29.10.10.09	UPRR York Street Crossing Plans	1/20/2017	S
29.10.10.10	BNSF Correspondence Comments and Miscellaneous	6/14/2016	S
29.10.10.11	RTD North Metro Line Files	4/15/2016	S
29.10.10.12	DRIR Correspondence Comments and Miscellaneous	6/14/2016	S
29.10.10.13	Railroad Permit Information	6/14/2016	S
29.10.10.14	UPRR Crossing Plans	3/17/2017	S
29.10.10.15	BNSF Crossing Plans	1/06/2017	S
29.10.10.16	UPRR 36th Yard Expansion Plans	3/24/2017	S
10.11	**Signing, Pavement Markings, Signalization, and Lighting**		
29.10.11.01	Interstate Access Request	10/27/2016	S
29.10.11.02	CCD Fiber - Interconnect	3/06/2017	S
29.10.11.04	CCD Fiber Mapping and Splicing	10/27/2016	S
29.10.11.05	Project Signing and Striping Concept Drawing	3/31/2017	S
29.10.11.06	Lighting Material	4/18/2017	S
10.12	**Cover MEP System**		
29.10.12.01	Design Fire Size	9/29/2015	S
29.10.12.02	Ventilation and Fire Life Safety Report	1/27/2017	S
29.10.12.03	CFD Modeling Study of Emergency Ventilation	9/29/2015	S
10.13	**Structures**		
29.10.13.01	Structure Plans	3/06/2017	S
29.10.13.02	Bridge Inspection Reports	4/25/2017	S
29.10.13.03	Structure Microstation Files	3/06/2017	S
29.10.13.04	Fire Truck Loading Exhibit	3/06/2017	S
10.14	**Landscaping and Aesthetics**		
29.10.14.04	Swansea School and Cover CAD Files	3/06/2017	S

Doc #	Document	Date Issued	Availability
29.10.14.05	DPS Phase II Design Development Plans	10/27/2016	S
29.10.14.06	DPS Temporary Wall Exhibit	3/06/2017	S
29.10.14.07	DPS MOA	10/27/2016	S
29.10.14.08	Corridor Landscape Exhibit[3]	4/18/2017	S
29.10.14.09	DPS Phase 3 Exhibit	4/18/2017	S
29.10.14.10	Draft Cover Maintenance Agreement	7/27/2017	S
11	**Operations and Maintenance**		
29.11.01	Operations and Maintenance Plans	3/06/2017	S
29.11.02	Operations and Maintenance Microstation Files	3/06/2017	S
29.11.03	Historic Maintenance Data	7/08/2016	S
29.11.04	CDOT Pavement Management Manual[1]	2/23/2016	S
29.11.05	Maintenance Facility Site Information	8/05/2016	S
17	**Environmental Requirements**		
29.17.01	I-70 East Supplemental Draft Environmental Impact Statement	9/29/2015	NS
29.17.02	I-70 East Final Environmental Impact Statement	1/15/2016	NS
29.17.03	I-70 East Record of Decision	1/20/2017	NS
29.17.04	Central 70 Mitigation Measures Status	3/06/2017	S
29.17.05	Limited Subsurface Investigation Report	1/20/2017	S
29.17.06	Environmental Site Assessments	4/18/2017	S
29.17.07	Existing Wetland Delineation and Riparian Limits	3/06/2017	S
29.17.09	Elyria and Swansea Neighborhood Plan	9/29/2015	NS
29.17.10	Noise Models	4/15/2016	S
29.17.11	Guidance for Central 70 Project Reuse of Excess Soil on City and County of Denver Owned Properties	3/31/2017	S

[1] The CDOT Pavement Management Manual dated 2008 is the most recent version of the manual.

Doc #	Document	Date Issued	Availability
29.17.12	Environmental Bridge Inspection Reports	11/06/2016	S
29.17.13	Parks and Recreational Resources 6(f) Limits	4/15/2016	S
29.17.14	I-70 East Air Quality Monitoring, Maintenance, and Mitigation Plan (AQ3MP) Template	4/15/2016	S
29.17.15	I-70 East Programmatic Agreement between FHWA, CDOT, and SHPO	5/6/2016	S
29.17.16	Asbestos Survey and Lead Based Paint Sampling for Demolition Reports	3/06/2017	S
29.17.17	Area of Potential Effect	3/06/2017	S
29.17.18	EPA VBI70 Record of Decision	6/14/2016	S
29.17.19	Environmental Site Assessments National Western Center Redevelopment Project	6/14/2016	S
29.17.20	Groundwater Pump Test	4/18/2017	S
29.17.21	Beneficial Reuse Materials Management Plan	09/12/2017	S
29.17.22	Site Characterization Reports	3/17/2017	S
29.17.23	CDOT Regulated Asbestos – Contaminated Soil Management Standard Operating Procedure	4/18/2017	S
29.17.24	Air Quality Modeling	3/06/2017	S
29.17.25	ROD Construction Limits	3/06/2017	S
29.17.26	Draft Environmental Covenant	3/22/2017	S
18	**Right-of-Way**		
29.18.01	Final Site Improvement Plans for Safeway Distribution Center North Employee & Visitor Parking Area	10/16/2017	S
29.18.02	Purina Structure As-Built Plans	9/29/2015	S
29.18.03	Purina Utility Plans	9/29/2015	S
29.18.04	Right-of-Way Microstation Files	4/18/2017	S
29.18.05	Title Commitments	3/06/2017	S

Doc #	Document	Date Issued	Availability
29.18.06	Original Swansea School Building and Underpass Approximate Locations	12/22/2016	S