

COLORADO  
 DEPARTMENT OF TRANSPORTATION  
 SPECIAL PROVISIONS  
 SH 93 RESURFACING: US6/SH 58 TO 58<sup>TH</sup> AVE

The 2022 Standard Specifications for Road and Bridge Construction controls construction of this project. The following special provisions supplement or modify the Standard Specifications and take precedence over the Standard Specifications and plans.

PROJECT SPECIAL PROVISIONS

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 DEPARTMENT OF TRANSPORTATION  
 SPECIAL PROVISIONS  
 SH 93 RESURFACING: US6 TO 58<sup>TH</sup> AVE  
 STANDARD SPECIAL PROVISIONS

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### NOTICE TO BIDDERS

The proposal guaranty shall be a certified check, cashier's check, or bid bond in the amount of 5 percent of the Contractor's total bid.

Pursuant to subsections 102.04 and 102.05, it is recommended that bidders on this project review the work site and plan details with an authorized Department representative. Prospective bidders shall contact one of the following listed authorized Department representatives at least 12 hours in advance of the time they wish to go over the project.

Program Engineer -	Mike Keleman Office Phone:	720-388-9588
Resident Engineer -	Cody Daigneault Office Phone:	720-628-6919
Project Engineer -	TBD	

The above referenced individuals are the only representatives of the Department with authority to provide any information, clarification, or interpretation regarding the plans, specifications, and any other contract documents or requirements.

Questions received from bidders along with CDOT responses will be posted on the CDOT website listed below as they become available.

<http://www.coloradodot.info/business/bidding/future-bidding-opportunities>

If the bidder has a question or requests clarification that involves the bidder's innovative or proprietary means and methods, phasing, scheduling, or other aspects of construction of the project, the Project Engineer will direct the bidder to contact the Resident Engineer directly to address the question or clarification. The Resident Engineer will keep the bidder's innovation confidential and will not share this information with other bidders.

The Resident Engineer will determine whether questions are innovative or proprietary in nature. If the Resident Engineer determines that a question does not warrant confidentiality, the bidder may withdraw the question. If the bidder withdraws the question, the Resident Engineer will not answer the question and the question will not be documented on the CDOT web site. If the bidder does not withdraw the question, the question will be answered, and both the question and CDOT answer will be posted on the web site. If the Resident Engineer agrees that a question warrants confidentiality, the Resident Engineer will answer the question, and keep both question and answer confidential. CDOT will keep a record of both questions and answers in their confidential file.

All questions shall be directed to the CDOT contacts listed above no later than 7:00 A.M. Monday of the week of bid opening. Final questions and answers will be posted no later than Tuesday morning of bid opening week.

Questions and answers shall be used for reference only and shall not be considered part of the Contract.

**COMMENCEMENT AND COMPLETION OF WORK  
(FLOATING START DATE)**

The Contractor shall select the date that contract time begins for this project, subject to the following conditions:

- (a) The earliest date shall be February 13, 2023
- (b) The latest date shall be April 3, 2023.
- (c) The Contractor shall notify the Engineer, in writing, at least 30 days before the proposed beginning date. If the earlier date, as stated above, follows the award date by less than 30 days, the Contractor's written notice to the Engineer shall be at least 10 days before the proposed beginning date.
- (d) The date that contract time begins shall be subject to the Region Transportation Director's approval. A different date may be authorized in writing by the Chief Engineer in the "Notice to Proceed."

The Contractor shall complete all work within 115 working days in accordance with the "Notice to Proceed."

If materials stockpiling begins before the beginning date, contract time will not be charged for the stockpiling effort. Stockpiling of materials before the beginning date is subject to the Engineer's approval. If such approval is given, stockpiled material will be paid for in accordance with Sections 109 and 626.

Subsection 108.05 shall include the following:

The Contractor shall complete the following discrete portions of the work (milestones) by the dates specified. A disincentive will be assessed for failure to complete the work for each milestone by the specified completion date.

Milestone No. 1

Completion Date: May 31, 2023

Description: The snow fence shall be removed from Stations 261+65 LT to 266+67 LT. Any ground disturbance due to the removal of this fence shall be seeded prior to May 31, 2023 as directed by the Engineer.

**DISADVANTAGED BUSINESS ENTERPRISE (DBE) CONTRACT GOAL**

This is a federally-assisted construction project. As described in the CDOT DBE Standard Special Provision, the Bidder shall make good faith efforts to meet the following contract goal:

12      Percent DBE participation.

**ON THE JOB TRAINING CONTRACT GOAL**

The Department has determined that On the Job Training shall be provided to trainees with the goal of developing full journey workers in the types of trade or classification involved. The contract goal for On the Job Trainees working in an approved training plan in this Contract has been established as follows:

Minimum number of total On the Job Training required 1600 hours

**REVISION OF SECTION 102  
PROJECT PLANS AND OTHER DATA**

Revise Section 102 of the Standard Specifications for this project as follows:  
Subsection 102.05 shall include the following:

Supplemental data is provided in DGN file formats. Instructions for downloading the supplemental data is posted on B2G. The supplemental data transmitted consists of:

- (a) Surfaces - DTM files of the following
  - (1) Existing Terrain Model
  - (2) Finished Grade Terrain Model
- (b) DGN files:
  - (1) 3D Components of the Project Design Model
  - (2) Right of Way
  - (3) Topography
  - (5) Project Alignments
- (c) Pavement Investigation Report

The Department does not warrant the supplemental data and this information is not considered to be a part of the Contract. If bidders use or modify the supplemental data in preparing a proposal or planning and prosecuting the work, all associated data is used at their own risk, and bidders are responsible for all conclusions, deductions, and inferences drawn from the original or modified supplemental data.

The following information will be available for review in the office of the Resident Engineer listed in the Notice to Bidders until the date set for opening of bids:

Cross Sections	Computer Output Data
Sheet Nos	
Roadway	Earthwork Quantities
133 to 141	

After the proposals have been opened, the low responsible bidder may obtain an electronic set of plans and special provisions from the CDOT Business Management System (B2Gnow) website here: <https://cdot.dbesystem.com/>. Also, if they are available for the project, the low responsible bidder may also obtain cross sections, major structure plan sheets, and computer output data.

Survey information is available. Download instructions are posted on B2G.



**REVISION OF SECTIONS 105 AND 608  
DETECTABLE WARNINGS**

Sections 105 and 608 of the Standard Specifications are hereby revised for this project as follows:

Subsection 105.03 shall include the following:

When corrective work is required for curb ramps, the Contractor shall submit a method statement in writing outlining the work to be performed. Corrective work for curb ramps shall not be performed until written approval has been received from the Engineer. All corrective work for curb ramps shall be at the Contractor's expense.

Subsection 608.01 shall include the following:

This work includes the installation of detectable warnings on concrete curb ramps as shown on the plans.

Subsection 608.02 shall include the following:

Detectable warnings on curb ramps shall be truncated domes of the dimensions shown on the plans or on Standard Plan M-608-1 Curb Ramps.

The final surface shall meet the requirements given in R305 of the PROWAG.

The domes and their underlying surface shall contrast visually with the adjacent gutter, street or highway, or pedestrian access route surface, either light-on-dark or dark-on light, per R305.1.3 of the PROWAG. The contrasting colors shall not be black and white. Unless specified otherwise in the Contract, the color of the domes and their underlying surface shall be red conforming to Federal Color Standard 33538. Material for the truncated domes shall be one of the following:

- (1) Embeddable Concrete or Masonry Pavers. The Contractor may use pavers upon written approval by the Engineer and with a signed maintenance agreement. Domes shall be prefabricated by the manufacturer as a pattern on concrete or masonry pavers. Pavers shall meet the requirements of ASTM C 902 or ASTM C 936. The paver contrast shall be achieved by adding pigment during the fabrication of the paver. Prior to the start of work, the Contractor shall submit appropriate documentation from the manufacturer verifying that the required contrast has been met, along with a sample plate to the Engineer for approval.

Bedding and joint sand for pavers shall be free of deleterious or foreign matter. The sand shall be natural or manufactured from crushed rock. Limestone screenings or stone dust shall not be used. Sand for bedding material shall conform to ASTM C 33. Sand that is to be placed between joints shall conform to ASTM C 144.

- (2) Embeddable Surface Plates. The domes shall be prefabricated by the manufacturer as a pattern on embeddable surface plates. Plates shall be one of the plates allowed for use as detectable warnings listed on CDOT's Approved Products List. Prior to the start of work, the Contractor shall submit appropriate documentation from the manufacturer verifying that the required contrast has been met, along with a sample plate to the Engineer for approval.
- (3) Detectable Warnings Fabricated On Site. Material for on-site fabrication of detectable warnings shall be a liquid-applied epoxy composed of resins, reactive monomers, pigments, glass beads, and fillers. The material shall be low-VOC compliant. The installed product shall have the following properties:

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**REVISION OF SECTIONS 105 AND 608  
 DETECTABLE WARNINGS**

**DETECTABLE WARNINGS FABRICATED ON SITE**

<b>Property</b>	<b>Test</b>	<b>Requirement</b>
Hardness	ASTM D 2240, Shore A	80 minimum after 24 hours
Tensile Strength	ASTM D 638	125 psi minimum at break
Adhesion	ASTM C 482	Concrete: 200 psi Asphalt: Cohesive failure of substrate
Skid Resistance		Shall remain Firm, Stable , and Slip-Resistant regardless of weather conditions

The color shall be integral to the material and shall be uniform throughout the domes and the underlying surface.

Subsection 608.03 shall include the following:

*(g) Detectable Warnings for Curbs Ramps.*

1. Pavers. Pre-fabricated pavers for detectable warnings shall be brought to the site in steel banded, plastic banded or plastic wrapped cubes capable of being transported by a forklift or clamp lift. Pavers shall be carefully removed and stacked in a manner which results in the least amount of damage. All pavers that are damaged during transport or delivery will be rejected and shall be replaced at the Contractor’s expense. Minor cracks or chipping due to transport and handling that do not interfere with the structural integrity of the paver or the overall pattern of truncated domes will not be deemed grounds for rejection.

The Contractor shall spread the bedding sand evenly in the area shown on the plans and shall screed the sand to an appropriate embedment depth as shown on the plans or as directed by the Engineer. Sufficient sand shall be placed to stay ahead of laid pavers.

Pavers shall be placed in a running bond pattern. Pavers shall be installed such that the base of the truncated dome is at the same elevation as the adjoining surface, allowing for a smooth transition between the curb ramp and the detectable warning.

When cut pavers are required to fill gaps between the pavers and the edge of concrete, the Contractor shall bevel portions of the truncated domes at a 45-degree angle to create a smooth transition between the partial dome and the curb ramp surface. Unless otherwise directed by the Engineer, pavers shall be cut and installed in such a manner that the domes on the cut sections will not significantly impact the overall pattern of the truncated domes.

The Contractor shall use a plate vibrator to embed the pavers into the sand. The size and type of plate vibrator shall be in accordance with manufacturer’s recommendations, or as directed by the Engineer. All pavers that are damaged during embedment shall be replaced at the Contractor’s expense.

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**REVISION OF SECTIONS 105 AND 608  
DETECTABLE WARNINGS**

Joint spacing between paver units shall be in accordance with the manufacturer's recommendations, or as approved by the Engineer. Joints shall be filled completely with joint sand. Excess sand shall be removed by sweeping.

2. Plates. Prior to installation of the plates, concrete conforming to subsection 608.02 shall be installed and consolidated as a base for the plates. The concrete shall be placed to a thickness that will allow the base surface of the plates to be at the same elevation as the adjacent concrete. The plates shall be embedded into the plastic concrete in accordance with the manufacturer's specifications.
3. Detectable Warnings Fabricated On Site. The detectable warnings shall be installed by a trained installer approved by the manufacturer. The detectable warnings shall be installed in accordance with the manufacturer's specifications. The general installation procedure shall be as follows:
  - (1) Prepare the surface to receive the detectable warnings.
  - (2) Apply the liquid material to the surface.
  - (3) Apply the template for the truncated domes.
  - (4) Apply the liquid material to the template.
  - (5) Remove the template.

If the manufacturer of the detectable warnings fabricated on site provides a standard warranty, the Contractor shall obtain that warranty and submit it to the Engineer.

Subsection 608.05 shall include the following:

Detectable warnings on curb ramps, including sand, pavers, plates, liquid epoxy, and all other work and materials necessary for fabrication, transport, and installation will not be measured and paid for separately, but shall be included in the work.

**REVISION OF SECTION 106  
CONFORMITY TO THE CONTRACT OF HOT MIX ASPHALT**

Section 106 of the Standard Special Provisions is hereby revised for this project as follows:

Subsection 106.05 shall include the following:

For this project, Contractor process control testing of hot mix asphalt is mandatory.

**REVISION OF SECTION 107  
CONSTRUCTION NOISE AND NIGHT WORK**

Revise Section 107 of the Standard Specifications for this project to include the following:

The Contractor shall comply with all State and local regulatory requirements regarding noise created by night work, specifically, any work that generates noise in excess of regulatory limits prescribed in CRS 25-12-103(1) between the hours of 7:00 p.m. and 7:00 a.m., or as defined by local regulations and ordinances, whichever is more stringent.

The Contractor shall research and comply with all City and County of Denver noise ordinances and any other restrictions applicable to nighttime construction activities. The Contractor shall coordinate with the City and County of Denver and the Engineer for any noise exemption, variance, or approval as required.

All requests for a noise variance and/or Engineer's approval of night work shall be submitted a minimum of 30 days prior to commencement of the work, and shall include the following information:

1. Requesting entity
2. Contact person and phone number
3. Specific location of the work
4. Types of activities to occur
5. Reason variance is being requested
6. Equipment proposed to be used
7. Start, end dates, and hours of proposed night work
8. Total number of nights of work.

The Contractor shall submit any noise exemption request to the Engineer for approval prior to sending to the jurisdictional authority. Nighttime construction activities with the potential to exceed applicable noise-level restrictions cannot begin until the jurisdictional authority and the Engineer have approved all required documentation and notifications.

Exemption requests, permitting requirements, and other requirements of this specification will not be paid separately but shall be included in the work.

## **REVISION OF SECTION 108 DISINCENTIVE FOR OFFLINE ITS DEVICES**

Section 108 of the Standard Specifications is hereby revised for this project to include the following:

### **DESCRIPTION**

The Contractor is responsible for all ITS devices and communications infrastructure contained within the limits of this project throughout the duration of the 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 Traffic Management System Building or if a device is not operating at optimal performance.

### **CONSTRUCTION REQUIREMENTS**

Anytime Contractor work impacts an ITS device or system, the Contractor shall notify CDOT ITS immediately upon discovery of an outage. This notice, as well as advanced notices described below for planned outages, shall be provided to CDOT ITS Network Operations Center (NOC) at [cdot\\_its\\_support@state.co.us](mailto:cdot_its_support@state.co.us) by the Contractor or Project Engineer.

#### *(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 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 detailed fiber optic backbone cutover plan to include all infrastructure and preparation work to be completed before the cutover, number of Fiber Technicians and splicing equipment to be used, identification of the priority fibers to be spliced first and contingency plan if an issue should arise to the Project Engineer who shall submit it to CDOT ITS for review two weeks prior to performing the work, as well as a one week advance notice to CDOT ITS of any fiber optic backbone cutover work. The cutover plan shall include a Hold Point Inspection with the Project Engineer and the Project ITS Representative at least 24 hours ahead of the cutover to confirm that all preparation work is on track to be completed. If the preparation work is determined to be incomplete at the time of the inspection, the contractor shall reschedule the cutover. The cutover may be rescheduled as early as one week after the originally planned cutover. This cutover plan shall detail how the Contractor shall sequence the cutover activities, so that the new backbone is installed and spliced into the existing devices and the node building such that a 7-hours downtime is not exceeded. CDOT’s network fibers and any in-use fibers shall be spliced first in the sequence. The fiber optic backbone splicing shall be scheduled for an overnight shift between 9 PM and 4 AM on a Sunday through Wednesday night, excluding holidays, or per the Project Engineer. The ITS network and other in use fibers shall be fully functional by 4 AM and the remaining fibers complete by 9 AM, unless otherwise approved by the Engineer.

For electrical work on node locations and for access to node locations for network system work, the Contractor shall notify the Project Engineer who shall generate a CDOT ITS NOC notification to have a ticket issued. This notification shall be generated at least 48 hours prior to the planned work. All work on or in a node location requires an approved CDOT representative to be on-site at all times during the work activities. Additionally, the Project Engineer & CDOT NOC shall be notified the day before the shutdown and on the morning of the day of the shutdown. Power shall be shut down in a responsible sequence 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 and should be planned during off-peak traffic hours.

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**REVISION OF SECTION 108  
DISINCENTIVE FOR OFFLINE ITS DEVICES**

- (2) Fiber optic laterals added to CDOT backbone: The Contractor shall submit a fiber optic splicing plan to the Project Engineer who shall submit it to CDOT ITS for review two weeks prior to scheduling the work, as well as a one week advance notice to CDOT ITS of any fiber optic lateral splicing work. This splicing plan shall detail how the Contractor shall sequence the splicing activities, the impacted systems or devices and a clear detail of what splicing will occur to include buffer tube and fiber strands. The plan shall include estimated duration of splicing activities and contingency plans if an issue should arise. Fiber optic lateral splicing shall only occur between 9 PM on Sunday and 12 PM on Friday, excluding holidays, unless approved by CDOT ITS. Fiber optic laterals may be approved to be performed during a single shift during daytime hours depending on the systems or devices the splicing will affect, this approval will come from CDOT ITS.
- (3) ITS Devices & Switches: The Contractor shall provide a 72-hour advance notice via the Temporary Offline Device Notification Form to the Project Engineer who shall submit it to CDOT ITS to coordinate any downtime for ITS devices or switches for a planned outage. Allowable offline periods for all ITS field devices & switches shall be a 48-hour period and allowable offline periods for tolling equipment & switches shall be a 24-hour period. Both ITS and Tolling offline periods shall be scheduled between Monday and Thursday, excluding holidays, unless otherwise approved by CDOT ITS and the Project Engineer. For planned outages where CDOT ITS receives this advance notice, the Contractor shall be charged a disincentive of \$50 per hour per each device that is offline beyond the 48 hour offline period unless there is a pre-approved extended outage time.

ITS field devices covered under this special provision include all Intelligent Transportation Systems devices and equipment, which includes but is not limited to Traffic Signals, CCTVs, MVRDs, RWISs, Ramp Meters, all types of VMSs, ATRs, WIMs, Tolling Points and Network Switches. No more than two ITS device locations shall be inoperable at any one time unless approved by CDOT ITS and the Project Engineer. The Contractor shall keep the existing network operational until the new network has been tested and approved by CDOT for device cutover.

*(a) Unplanned ITS Outages*

An “unplanned outage” is considered to be any loss of network communications or device functionality that CDOT ITS does not receive proper advance notice, as described above, and is due to the Contractor’s negligence, act or omission under their control as a result of project activities.

- (1) ITS Network: If the Contractor damages a CDOT ITS fiber optic backbone, or if CDOT ITS loses communications or power to a node building or operations center as a result of the Contractor’s negligence, act or omission under their control, the Contractor shall be charged a disincentive. This first time network disincentive rate shall be \$1,000 per hour, and an additional \$2,000 per hour for a communications or power outage that results in loss of data and video to a node building or operations center.

This disincentive rate shall increase to \$2,000 per hour the second time, and an additional \$3,000 per hour for a communications or power outage that results in loss of data and video to a node building or operations center. This increase of \$1,000 per hour will continue for any further outages to the CDOT Network. Additionally, the Contractor shall be responsible for any charges involved with investigating such an outage and restoration of the ITS network to full working condition. These disincentive rates are in addition to any costs that may be levied by private utility owners for loss of communications.

**3**  
**REVISION OF SECTION 108**  
**DISINCENTIVE FOR OFFLINE ITS DEVICES**

- (2) ITS Devices: For unplanned outages or outages where CDOT ITS does not receive advance notification and the outage is a result of project activities, the Contractor shall be charged a disincentive of \$50 per hour for each device that is offline beginning at the time of the outage.

**METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

All work, materials, and equipment required to reset, reconfigure and perform cutover will not be measured and paid for separately, but shall be considered incidental to the work.

This disincentive is not a penalty, but is based on costs associated with the disruption of corridor operations, information to the traveling public, and general safety of the traveling public.

There will be no incentive paid for this work.

The disincentive will be deducted from any monies owed to the Contractor for work performed.

In addition to those disincentives described above, the Contractor will be responsible to pay any penalties charged by private utility owners as a result of damage to their facilities.





**REVISION OF SECTION 202  
RECLAIMED ASPHALT PAVEMENT MILLINGS**

Section 202 of the Standard Specifications is hereby revised for this project as follows:

Subsection 202.09 shall include the following:

CDOT will retain approximately 1500 tons of RAP milling from the project. All remaining RAP millings, if any, may be used in the project as allowed in the Contract or as approved by the Engineer. Otherwise, they shall become the property of the Contractor and shall be disposed of at his expense outside the project limits.

For this project, the RAP millings that CDOT will retain shall be delivered and stockpiled at the following location(s):

- Stockpile area near the intersection of W 120th Avenue and Indiana Street and the intersection of W 120th Avenue and McCaslin Blvd

Subsection 202.12 shall include the following:

Unless otherwise specified in the Contract, the disposal and hauling of the RAP millings to other locations or its use on the project or at other locations will not be measured and paid for separately, but shall be included in the work.

**REVISION OF SECTION 202  
REMOVAL OF ASPHALT MAT (PLANING)**

Section 202 of the Standard Specifications is hereby revised for this project as follows:

Delete subsection 202.09, and replace it with the following:

**202.09 Removal of Asphalt Mat (Planing).** Prior to beginning planing operations, the Contractor shall submit a planing plan and a Process Control Plan (PCP) for approval by the Engineer. The planing plan shall include at a minimum:

- (1) The number, types and sizes of planers to be used.
- (2) The width and location of each planing pass.
- (3) The number and types of brooms to be used and their locations with respect to the planers.
- (4) The proposed method for planing and wedging around existing structures such as manholes, valve boxes, and inlets.
- (5) The longitudinal and transverse typical sections for tie-ins at the end of the day.
- (6) If requested by the Engineer, a plan sheet showing the milling passes.

The PCP shall include as a minimum:

- (1) The schedule for replacing the cutting teeth.
- (2) The daily preventive maintenance schedule and checklist.
- (3) Proposed use of automatic grade controls.
- (4) The surface testing schedule for smoothness.
- (5) The process for filling distressed areas.
- (6) The schedule for testing macrotexture of the milled surface.
- (7) Corrective procedures if the milled surface does not meet the minimum macrotexture specification.
- (8) Corrective procedures if the milled surface does not meet the minimum transverse or longitudinal surface finish when measured with a 10 foot straightedge.

The Contractor shall not start the planing operation until the hot mix asphalt (HMA) mix design has been approved and a Form 43 has been signed by the Engineer.

The existing pavement shall be milled to the cross-slope as shown on the plans, and shall have a surface finish that does not vary longitudinally or transversely more than  $\frac{3}{8}$  inch from a 10 foot straightedge. A 10 foot straightedge shall be supplied by the Contractor.

All milled surfaces shall be broomed with a pick-up broom, unless otherwise specified, before being opened to traffic. A sufficient number of brooms shall be used immediately after planing to remove all milled material remaining in the roadway.

2

**REVISION OF SECTION 202  
REMOVAL OF ASPHALT MAT (PLANING)**

If the Contractor fails to adequately clean the roadway, work shall cease until the Engineer has approved the Contractor's revised written proposal to adequately clean the roadway.

The milled surface shall have a macrotexture equal to or less than 0.170 inches for single-lift overlays and 0.215 inches for multiple-lift overlays as tested in accordance with CP 77. Milled surfaces that do not meet these criteria shall require corrective action in accordance with the PCP. The Contractor shall be responsible for testing the macrotexture of the milled surface at the location directed by the Engineer in accordance with CP 77 at a stratified random frequency of one test per 10,000 square yards or a minimum of once per work day.

At the completion of each day's work, longitudinal vertical edges greater than 1 inch shall be tapered. No transverse vertical edges will be allowed. Longitudinal milled surface tie-ins to existing pavement shall be tapered to not less than a 3:1 slope, transverse milled surface tie-ins to existing pavement shall be tapered to not less than a 50:1 slope. Transverse tapered joints may be tapered with the planing machine, a temporary asphalt ramp, or other methods approved by the Engineer. No longitudinal joint between the milled and existing surfaces shall fall between 1 to 5 feet of any lane line.

If the transverse joint is tapered with a temporary asphalt ramp, the milled surface at the joint shall be constructed as a butt joint the full depth of the lift of asphalt to be placed on the milled surface. The Contractor shall be responsible for maintaining this asphalt ramp until all corresponding HMA is placed. All work associated with this joint will not be paid for separately, but shall be included in the cost of planing.

If the transverse joint is tapered with a planing machine, a butt joint shall be cut into the taper the full depth of the lift of asphalt to be placed on the milled surface prior to commencement of resurfacing. All work associated with this joint will not be paid for separately, but shall be included in the cost of planing.

Other approved transverse joint tapers shall be maintained at the expense of the Contractor, and at a minimum shall incorporate a butt joint the full depth of the lift of asphalt to be placed on the milled surface prior to commencement of resurfacing.

Distressed or irregular areas identified in the planed surface by the Engineer shall be patched.

The roadway shall be left in a safe and usable condition at the end of each work day. The Contractor shall take appropriate measures to ensure that the milled surface does not trap or hold water. All required pavement markings removed by the planing shall be restored before the roadway is opened to traffic.

**3**  
**REVISION OF SECTION 202**  
**REMOVAL OF ASPHALT MAT (PLANING)**

All milled surfaces to be overlaid with HMA shall be covered with new asphalt within 5 working days. All areas on this project that are not overlaid within the specified working days will be assessed a lane rental fee of \$800 per occurrence for each day or fraction thereof and any required surface repairs shall be paid for by the Contractor.

All planing shall be completed full width and parallel to the travel lanes before resurfacing commences unless otherwise directed by the Engineer.

All material generated by the planing operation shall become the property of the Contractor unless otherwise noted in the Contract.

Each planer shall conform to the following:

The planer shall have sufficient power, traction and stability to maintain an accurate depth of cut. The propulsion and guidance system of the planer shall be maintained in such condition that the planer may be operated to straight and true lines.

The planer shall be capable of operating with automatic grade controls (contact or non-contact) on both sides of the machine using a 30 foot averaging system or other approved grade control systems. The use of such controls shall be described in the Contractor's PCP.

The planer shall be capable of picking up the removed material in a single operation. A self-loading conveyor shall be an integral part of the planer. Windrows will not be allowed.

Subsection 202.12 shall include the following:

Macrotexture testing, macrotexture corrective actions, planers, brooms, and all other work necessary to complete the item, Removal of Asphalt Mat (Planing), will not be measured and paid for separately, but shall be included in the work.

**REVISION OF SECTION 202  
REMOVAL OF PAVEMENT MARKING**

Section 202 of the Standard Specifications is hereby revised for this project as follows:

**CONSTRUCTION REQUIREMENTS**

Subsection 202.05 shall include the following:

Pavement markings designated for removal and replacement shall be removed to a depth of 35 mils +/- 5 mils. The Contractor shall use gang stacked diamond tip blades or equivalent to create a smooth application surface to the satisfaction of the Project Engineer and have a vacuum machine on site to control dust paid for within the pay item.

The Contractor shall not perform any more removals than can be applied by the pavement marking truck during the same working day or working period.

If a rain event occurs during removal and marking application, the Contractor shall halt the removal operation and raised flexible pavement markers shall be placed at locations that have been removed but not marked while the pavement is drying prior to the marking application. Marking application shall resume when pavement is dry and has had no moisture for a minimum of 24 hours. Raised flexible pavement markers shall be installed with one marker at 40-foot centers.

Grooves shall be clean, dry, and free of laitance, oil, dirt, grease, paint, or other foreign contaminants. The Contractor shall prevent traffic from traversing the grooves and shall re-clean grooves, as necessary, prior to application of the epoxy pavement markings.

**BASIS OF PAYMENT**

Subsection 202.12 shall include the following:

Payment will be made under:

<b>Pay Item</b>	<b>Pay Unit</b>
Removal of Pavement Marking	Square Foot

The work to groove the asphalt or concrete and clean the grooving residual or debris will not be measured and paid for separately but shall be included in the work.

Temporary markings will not be measured and paid for separately but shall be included in the work.

**REVISION OF SECTION 202  
CLEAN CULVERT**

Revise Section 202 of the Standard Specifications for this project as follows:

Subsection 202.01 shall include the following:

This work consists of cleaning, removing, and disposing of sediment and other debris in the storm drain inlets and culverts at locations shown on the plans.

Subsection 202.10 shall include the following:

Before cleaning operations, remove and store all grates and other appurtenances from the inlet or culvert pipe.

Perform culvert cleaning using a vacuum truck method as approved. Use a high-pressure washer to strip off all soil sediment and other debris accumulated on the structure's walls. Suction the mix of water and debris out of the structure and into the vacuum truck. Dispose of removed material at a suitable facility located off the project site per applicable regulations and guidelines. The remaining material left in the structure after cleaning shall be removed at the Contractor's expense. Document and provide in writing the total amount of material removed.

Replace all damaged or missing bolts for the grates and other appurtenances. Upon completing cleaning, treat existing and new bolts required for the grates and other appurtenances with anti-seize compound. Then, reinstall the grate and appurtenances using the treated bolts.

If debris accumulates in clean structures during construction, reclean structures at the Contractor's expense.

Subsection 202.11 shall include the following:

Measure Clean Culvert by the actual number of existing culvert pipes and inlets that are cleaned and accepted. Cleaning of drainage pipe between inlets, barrier drain holes, and flaps, when required, will not be measured or paid for separately; include it in the work price.

Subsection 202.12 shall include the following:

Pay under:

<b>Pay Item</b>	<b>Pay Unit</b>
Clean Culvert	Each
Clean Inlet	Each

Payment will consist of full compensation for all labor, materials, and equipment required to clean, maintain, remove, and dispose of sediment and other debris from storm drain inlets and culverts prior to construction.

The amount of anti-seize compound and new bolts required will not be measured and paid for separately; include it in the work price.

The quantity of debris and water disposal will not be measured and paid for separately; include it in the work price.

The amount of water required for pressure washing will not be measured and paid for separately; include it in the work price.

**REVISION OF SECTION 202  
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 removed cabinets and all appurtenances including controller(s) and all other equipment internal to the cabinet shall be delivered to a CDOT specific location. Contact Jeff Lancaster at (303) 757 9511 for designation of salvable materials and location of delivery. Existing cabinet and controller assemblies at the locations depicted in the plans shall be removed.

All salvable material shown on the plans shall be removed, without unnecessary damage, in sections or pieces that may be readily transported, and delivered by the Contractor to the location noted above, or as directed by the Engineer. The Contractor shall be held responsible for the safekeeping of all salvable materials during the period of the Contract until they are delivered to the CDOT location. The Contractor shall make good or replace at his own expense any such materials damaged, stolen or otherwise lost prior to receipt by CDOT. All salvable materials, as designated on the plans, shall remain the property of CDOT.

Subsection 202.04 shall include the following:

Removal of the traffic signal equipment shall include signal poles, pedestal poles, footings (removed two feet below final grade), span wire cable, traffic signal controller and cabinet, pedestrian push buttons, cabinet footings, all attachment hardware, attached signs, and all incidental equipment, except as noted on plans. All existing foundations and pull boxes shall be removed and backfilled. All wiring shall be removed from existing conduit and the conduit shall be abandoned in place.

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 the location provided by Jeff Lancaster. This work shall be included in the cost of Removal of Traffic Signal Equipment and will not be paid for separately.

Subsection 202.12 shall include the following:

<b>Pay Item</b>	<b>Pay Unit</b>
Removal of Traffic Signal Equipment	LS

Payment includes all labor, equipment and materials necessary to complete the work.



## **REVISION OF SECTION 207 Topsoil (Wetland)**

Section 207 of the Standard Specifications is hereby deleted for this project and replaced with the following:

### **DESCRIPTION**

**207.01** This work consists of salvaging Topsoil (Wetland) onsite, stockpiling, maintaining, and the placement of the Topsoil (Wetland) at locations shown on the plans. Substitutions from this specification will not be allowed unless submitted in writing to the Engineer for approval and review by the Region Wetland Biologist.

### **MATERIALS**

#### **207.02 General.**

Topsoil (Wetland) shall be free of refuse and litter along with noxious weed seed, as listed in current State of Colorado A and B Noxious Weed Lists and local agency weed lists.

Topsoil (Wetland) shall consist of moist, organic soil obtained from delineated wetlands, including any existing wetland vegetation and seeds. Topsoil (Wetland) shall be salvaged from onsite at locations as shown on the plans or as directed, to a minimum depth of 12 inches or at the depths as shown on the plans. If Topsoil (Wetland) cannot be placed within 24 hours, then it should be stockpiled for as short duration as possible and no more than six months. The contractor shall keep stockpiled Topsoil (Wetland) moist at all times, either through covering and/or light watering. Soil amendments shall not be placed on Topsoil (Wetland).

### **CONSTRUCTION REQUIREMENTS**

**207.03 Wet Topsoil Stockpiling.** Stockpiles of Topsoil (Wetland) shall be created as shown on the plans or as approved by the Engineer. All stockpiles of Topsoil (Wetland) which are scheduled to remain in place for 14 days or more shall receive interim stabilization in accordance with 208. All Topsoil (Wetland) stockpiles shall be identified using white pin flags with "Topsoil (Wetland)" printed in black letters and shall have their locations shown on the SWMP Plans. Each individual stockpile shall require at least one flag, and one additional flag for each 10 cubic yards of salvaged Topsoil (Wetland). The contractor shall provide only perimeter flags for stockpile larger than 100 cubic yards with a minimum spacing of 25 feet.

Wetland stockpiles shall not be treated with herbicide. Weeds shall be hand pulled. Topsoil (Wetland) shall be placed within 24 hours from excavation, unless otherwise approved by the Engineer. Topsoil (Wetland) shall not be stockpiled for more than six months.

**207.04 Placement of Topsoil (Wetland).** Topsoil (Wetland) shall be hauled and placed at the locations disturbed as shown on the plans. The contractor shall place a minimum thickness of 6 inches and should only be handled when it is dry enough to work without damaging soil structure.

Topsoil (Wetland) shall be placed a minimum depth of twelve (12) inches when placed over riprap as required on the plans. No Topsoil (Wetland) shall be placed below ordinary high water mark except as otherwise specified in bio-stabilization bank treatments.

Salvaged Topsoil (Wetland) placement deeper than 6 inches is allowed if additional approved material is on-site.

2  
**REVISION OF SECTION 207**  
**Topsoil (Wetland)**

Contractor shall place Topsoil (Wetland) in a method that does not re-compact subgrade material using low ground-contact pressure equipment, or by excavators and/or backhoes operating adjacent to it.

The final grade shall be free of all materials greater than 4 inches in diameter within the designed clear zone for the project. Equipment not required for revegetation work will not be permitted in the areas of placed Topsoil (Wetland).

**METHOD OF MEASUREMENT**

**207.05** Topsoil (Wetland) material will be measured by the actual number of cubic yards of Topsoil (Wetland) placed and accepted.

Subgrade soil preparation will be measured by the square yards of subgrade which is ripped and accepted for adequate de-compaction.

**BASIS OF PAYMENT**

**207.6** The accepted quantities measured will be paid for at the Contract unit price for each of the pay items listed below that appear in the bid schedule.

Payment will be made under:

<b>Pay Item</b>	<b>Pay Unit</b>
Topsoil (Wetland)	Cubic Yard

Noxious Weed Management will be measured and paid for in accordance with Section 217.

Stockpiling of Topsoil (Wetland) will not be measured and paid for separately, but shall be included in the work.

Removing of clods, sticks, stones, debris, concrete, and asphalt in excess of 4 inches in any dimension for all Topsoil (Wetland) used within the designed clear zone for the project will not be measured and paid for separately but shall be included in the work.

Topsoil (Wetland) signage (pin flags) will not be measured and paid for separately but will be included in the cost of the work.

**REVISION OF SECTION 210  
MODIFY OR RESET PEDESTRIAN PUSH BUTTON**

Section 210 of the Standard Specifications is hereby revised for this project as follows:

Subsection 210.09 shall include the following:

Reset Pedestrian Push Button includes all work and materials necessary to adjust the height and reach of existing pedestrian push buttons. Push buttons shall be mounted at a height of 42 inches above the finished sidewalk surface. Where necessary the height may be increased to a maximum of 48 inches. The side reach shall not be greater than 10 inches. Where specified, the Contractor shall extend the finished sidewalk surface toward the existing pedestrian push button to meet the reach requirements without an extender bracket. When extender brackets are necessary at ADA ramp locations they shall not be greater than 10 inches in length. If the Contractor discovers site constraints such that the height and reach dimensions cannot be met, he shall notify the Engineer. Height and reach requirements are shown in the attached detail.

Sidewalk extensions shall be constructed in accordance with Section 608.

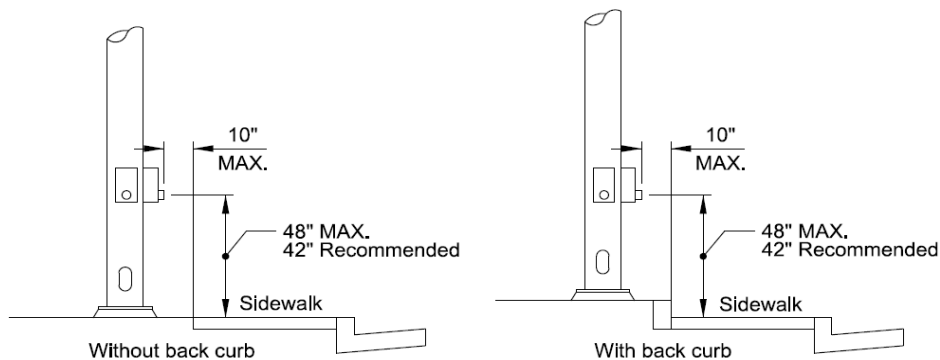
In subsection 210.12 delete the ninth (final) paragraph and replace it with the following:

Resetting or modification of traffic signals, pedestrian push buttons and related equipment, poles, controllers, cabinets, preemption units, coordination and interconnection equipment, and related equipment and materials shall include all work necessary to remove the items from their existing location and reset them at the new location, and shall include all mounting hardware, footings, other electrical equipment and service, and all other materials and work necessary to complete the reset item in service at the new location.

The quantity to be measured for “Modify Pedestrian Push Button” shall be the actual number of existing push buttons that are adjusted for ADA compliance or via an extender bracket.

Subsection 210.13 shall include the following:

Pedestrian push button extenders will not be measured and paid for separately, but shall be included in the work. Sidewalk extensions at pedestrian push buttons will be measured and paid for in accordance with Section 608.



**REVISION OF SECTION 210  
RESET STRUCTURE**

Section 210 of the Standard Specification is hereby revised for this project as follows:

Subsection 210.01 shall include the following:

This work consists of resetting the City of Golden’s art statues from their current location as shown in the plans to the location as determined by the City of Golden Project Coordinator and as directed by the Engineer.

**CONSTRUCTION REQUIREMENTS**

**210.12 Art Statues.** Art statues complete with foundations are to be removed and reset on new foundations complete with anchor plates and bolts in accordance with the Caisson Detail provided in the Plans.

At least two (2) weeks prior to resetting the structures, the Contractor shall coordinate with the City of Golden (John Hardy, Public Works Project Coordinator at 303-618-9871 or jhardy@cityofgolden.net) to confirm the reset locations. The reset locations will be located east of their existing locations, within project limits.

**BASIS OF PAYMENT**

The accepted quantities will be paid for at the contract unit price listed below that appears in the bid schedule.

<b>Pay Item</b>	<b>Pay Unit</b>
Reset Structure	Each

Payment includes all labor, equipment, and materials necessary to complete the work.

**REVISION OF SECTION 212  
 SOIL AMENDMENTS AND SEEDING**

Delete Section 212 of the Standard Specifications for this project and replace with the following:

*a.* DESCRIPTION

**212.01** Work consists of application of soil amendments including, biotic soil amendments (hydraulically applied), humate, mycorrhizae, seedbed or soil preparation and placing seed. Soil amendments shall not be used in wetland topsoil unless approved in approved by the Engineer or Region Biologist.

Substitutions from this specification will not be allowed unless submitted in writing to the Engineer for approval with review by the Region Landscape Architect.

*b.* MATERIALS

**212.02 Soil Amendments, Biotic Soil Amendments (Hydraulically Applied), Humate, Mycorrhizae, Seed (Native Hydraulic, Broadcast).**

1. Compost for Erosion Log (Type 2) shall meet the gradation and physical properties as shown in Table 212-1 and Table 212-2.

**Table 212-1  
 Gradation for Erosion Log (Type 2) Compost**

Sieve Size	Percent Passing		Test Method
	Minimum	Maximum	
75.0 mm (3")	100		TMECC 02.02-B, "Sample Sieving for Aggregate Size Classification"
25.0 mm (1")	90	100	
9.5 mm (3/8")	10	50	

Note: Organic matter for erosion log compost shall be no more than 4 inches in length. Furnish compost from a participating producer in the USCC STA program.

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**REVISION OF SECTION 212  
SOIL AMENDMENTS AND SEEDING**

**Table 212-2  
Properties for Erosion Log (Type 2) Compost**

Compost Parameters	Reported as	Requirements	Test Method
pH	pH units	6.0 - 8.5	TMECC 04.11-A
Soluble Salts (Electrical Conductivity)	dS/m (mmhos/cm)	< 5.0	TMECC 04.10-A
Moisture Content	%, wet weight basis	< 60%	TMECC 03.09-A
Organic Matter Content	%, dry weight basis	25% - 100%	TMECC 05.07-A
Man-made Inert Contamination (plastic, concrete, ceramics, metal, etc.)	%, dry weight basis	< 0.5%	TMECC 03.08-A
Stability (respirometry)	mg CO <sub>2</sub> -C per g TS per day mg CO <sub>2</sub> -C per g OM per day	N/A	TMECC 05.08-B
Select Pathogens and weed free	(PASS/FAIL) Limits: Salmonella < 3 MPN/4 grams of TS, or Coliform Bacteria < 1000 MPN/gram	Pass	TMECC 07.01-B Fecal Coliforms, or 07.02 Salmonella
Trace Metals	(PASS/FAIL) Limits (mg kg <sup>-1</sup> dw basis): Arsenic (As) 41, Cadmium (Cd) 39, Copper (Cu) 1500, Lead (Pb) 300, Mercury (Hg) 17, Nickel (Ni) 420, Selenium (Se) 100, Zinc (Zn) 2800	Pass	TMECC 04.06
Maturity (Bioassay) Percent Emergence	%, (average)	N/A	TMECC 05.05-A
Relative Seedling Vigor	%, (average)	N/A	

- (a) *Biotic Soil Amendments (Hydraulically Applied)*. Soil amendments shall be a combination of natural fibers, growth stimulants, and other biologically active material designed to improve seed germination and vegetation establishment as shown in Table 212-8. Furnish biotic soil amendments in pre-packaged, ultraviolet and weather resistant packaging, and labeled from the manufacturer. The Engineer will reject all bags (containers) which arrive at the project site opened, damaged, or lacking a label. The Engineer will reject all bulk shipments such as tote bags. Store biotic soil amendments in locations not exceeding 80 °F. Acceptance of material shall be subject to the requirements of the Department’s Approved Product List (APL).

Use of mulch tackifier (*Plantago insularis*) or pre-gelatinized corn starch polymer) shall be in accordance with Section 213. Furnish a continuous and uniform cover of biotic soil amendments. Biotic soil amendments shall consist of one of the components in Table 212-3 and all performance and physical properties in Table 212-4.

**3**  
**REVISION OF SECTION 212**  
**SOIL AMENDMENTS AND SEEDING**

**Table 212-3**  
**Required Percentage Ranges of Biotic Soil Amendments**

Components	Units	Requirement
Professional grade sphagnum peat moss, professional grade reed sedge peat moss or compost that meets the Seal of Testing Assurance Program of the US Composting Council	%, dry weight basis	> 41%
Mechanically processed straw consisting of weed free agricultural straw, flexible flax fiber or rice hulls	%, dry weight basis	< 57%

**Table 212-4**  
**Performance and Physical Requirements of Biotic Soil Amendments**

Parameters	Reported as	Requirement	Test Method
pH	pH units	5.0 – 7.5	ASTM D1293
Moisture content	%, wet weight basis	10% - 50%	ASTM D 2974
Organic matter content	%, dry weight basis	> 85%	ASTM D586
Carbon Nitrogen Ratio	Ratio C:N	< 38:1	ASTM E1508
Man-made inert contamination	%, dry weight basis	< 1.0%	
Acute Toxicity	(Pass/Fail)	Pass (non-toxic)	ASTM E729-96(2014) or EPA Method 2021.0 or EPA Method 2002.0
Vegetative Minimum		> 400%	ASTM 7322
The Contractor shall provide a Certified Test Report for the required parameters in accordance with subsection 106.13.			

- (b) *Humate*. Furnish a screened dry granular form of organic humic and fulvic acid substance. Humate shall be pre-packaged and labeled from the manufacturer. Use bulk shipments such as tote bags or super sacks that have a manufacture’s original label and sealed at the manufacturing facility. The Engineer will reject all bags (containers) which arrive at the project site opened, damaged, or lacking label. Store humate in locations not exceeding 80°F. Apply humate in accordance with the rates shown on the plans. Humate shall conform to the parameters in Table 212-5 and Table 212-6.

**Table 212-5**  
**Screened Size Requirements for Humate**

Seeding Method	Reported as	Requirement
Seeding (Native) Drill, Hydraulic and Broadcast	inches	< 1/4 [1]

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**REVISION OF SECTION 212  
SOIL AMENDMENTS AND SEEDING**

**Table 212-6  
Performance and Physical Requirements of Humate**

Parameters	Reported as	Requirement	Test Method
Organic Matter	%, dry weight basis	>70%	n/a
Fines (material that is finer than the No. 200 (75-µm) sieve)	%, dry weight basis	<2%	ASTM D7928
pH	pH units	3.0 - 4.5	ASTM D1293
Acute Toxicity	Pass / Fail	Non Toxic	ASTM 7101 or EPA Method 2021 or 2002
Humic and Fulvic Acids	%, dry weight basis	> 70%	A & L Western method; total alkali extractable
Carbon Content	%, dry weight basis	40% - 50%	n/a
Moisture Content	%, dry weight basis	< 20%	n/a
Heavy Metal / Ash Content	%, dry weight basis	< 15%	n/a
The Contractor shall provide a CTR with independent laboratory analysis for the required parameters in accordance with subsection 106.13.			

(c) *Mycorrhizae*. Furnish mycorrhizae in original and undamaged packaging. Follow manufacturer’s safety recommendations for handling. Store mycorrhizae onsite in a manner to avoid direct sunlight exposure of greater than four hours and prevent exposure to temperatures above 85 °F. Endo mycorrhizal inoculum shall have a minimum of 60,000 propagules per pound, conform to the parameters in Table 212-7, and contain all of the following species:

- (1) *Glomus intraradices* (a.k.a. *Rhizophagus intraradices*)
- (2) *Glomus mosseae* (a.k.a. *Funneliformis mosseae*)
- (3) *Glomus aggregatum* (a.k.a. *Rhizophagus aggregatus*)
- (4) *Glomus etunicatum* (a.k.a. *Claroideoglomus etunicatum*)

**Table 212-7  
Physical Requirements of Endo Mycorrhizae**

Parameters	Reported as	Requirement	Test Method
Acute Toxicity	Pass or Fail	Non Toxic	ASTM 7101 or EPA Method 2021 or 2002
The Contractor shall provide a Certified Test Report with independent laboratory analysis completed on the product for the required parameters in accordance with subsection 106.13.			

The Contractor shall furnish the following product for seeding methods:

- (2) For Seeding (Native) Drill, Furnish mycorrhizae product as a dry free-flowing granular material, suitable for application by agricultural drill seeder.



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**REVISION OF SECTION 212**  
**SOIL AMENDMENTS AND SEEDING**

- (3) For Seeding (Native) Hydraulic, furnish mycorrhizae product as a fine granular (< 2 mm) or powdered form (particle size less than 300 microns) that will permit complete suspension when used with hydro-seeder equipment.
- (4) For Seeding (Native) Broadcast, furnish mycorrhizae product as a dry free-flowing granular material, suitable for application by fertilizer spreader.
- (d) *Seed.* Deliver seed to the project site in sealed bags tagged by a registered seed supplier conforming to the requirements of the Colorado Seed Act, CRS 35-27-111(1). Project seed shall not be in the Contractor's possession for more than 30 days from the date of pickup or delivery date on the seed vendor's packing slip. The Engineer will reject all bags opened or damaged prior to inspection. The State required legal tags shall remain attached to the bag until opened and the seed poured into either the drill or hydraulic seeders in the presence of the Engineer. The Engineer will remove all tags after the seed planting. Each seed tag shall clearly show the following:
  - (1) Name and address of the supplier
  - (2) Botanical and common name for each species
  - (3) Lot numbers
  - (4) Percent by weight of inert ingredients
  - (5) Guaranteed percentage of purity and germination
  - (6) Pounds of Pure Live Seed (PLS) of each seed species
  - (7) Total net weight in pounds of PLS in the sealed bag
  - (8) Calendar month and year of test date

Seeds shall be free from all noxious weed seeds in accordance with Colorado Seed Act (CRS 35-17) prohibited noxious weed seed list.

Weed seed content shall not exceed the requirements in part 7.2 of the Colorado Department of Agriculture's Seed Act Rules and Regulations.

The Engineer will not accept seed that has become wet, moldy, or damaged in transit or in storage.

Seed and seed labels shall conform to all current State regulations and to the testing provisions of the Association of Official Seed Analysis. Computations for quantity of seed required on the project shall include the percent of purity and percent of germination.

Store seed under dry conditions, at temperatures between 35 °F to 90 °F, under low humidity, and out of direct sunlight. The Contractor shall provide access to the Engineer to stored seed. The Engineer will reject seed stored by the Contractor for over 30 days.

**6**  
**REVISION OF SECTION 212**  
**SOIL AMENDMENTS AND SEEDING**

**CONSTRUCTION REQUIREMENTS**

**212.03 Submittals.** Provide the name and contact information of the seeding contractor 30 days prior to start of seeding work. Provide two copies of items (1) - (14) listed below to the Pre-vegetation Conference in accordance with Section 207. When the Contractor provides resubmittals to meet Contract requirements, copy the Region or Headquarters Landscape Architect on all correspondence.

- (1) Provide written confirmation from the registered seed supplier, on the Contractor's letterhead, that they have secured the Contract specified seed. The Engineer will not accept substitutions unless evidence is submitted, from one of the registered seed suppliers that the Contract specified seed is not available and will not become available during the anticipated construction period.
- (2) Seed vendor's "seed dealer" endorsement.
- (3) A copy of germination report of analysis for each seed species verifying testing of the lot by a Colorado Department of Agriculture recognized seed testing laboratory within 13 months prior to the date of seeding.
- (4) A copy of purity laboratory report of analysis for each seed species verifying testing of the lot by a recognized seed testing laboratory. The report shall contain all identified species, seed count, and date of test.
- (5) Manufacturer's documentation confirming that biotic soil amendment meets the required physical and performance criteria based on independent testing by the manufacturer.
- (6) Manufacturer's documentation confirming that humate meets the required physical and performance criteria based on independent testing by the manufacturer.
- (7) Manufacturer's documentation confirming that mycorrhizae meets the physical criteria based on independent testing and provides the minimum required species.
- (8) Pictures and descriptions of proposed seeding equipment to be used on the project. Based on the seeding methods required, at a minimum, this should include the hydraulic seeder.
- (9) Instructions and documentation on how seeders will be calibrated onsite, in accordance with subsection 212.05(a).

**212.04 Seeding Seasons.** Seeding in unirrigated areas shall be restricted according to the parameters in Table 212-8.

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**REVISION OF SECTION 212  
 SOIL AMENDMENTS AND SEEDING**

**Table 212-8  
 Seeding Seasons**

Zone	Spring Seeding	Fall Seeding
<b>Areas other than the Western Slope</b>		
Below 6000'	Spring thaw to June 1	September 15 or until consistent ground freeze
6000' - 7000'	Spring thaw to June 1	September 1 or until consistent ground freeze
7000' - 8000'	Spring thaw to July 15	August 1 or until consistent ground freeze
Above 8000'	Spring thaw to consistent ground freeze	
<b>Western Slope</b>		
Below 6000'	Spring thaw to May 1	August 1 or until consistent ground freeze
6000' - 7000'	Spring thaw to June 15	September 1 or until consistent ground freeze
Above 7000'	Spring thaw to consistent ground freeze	

- (1) "Spring thaw" is the earliest date in a new calendar year in which seed can be buried ½ inch into the surface soil (topsoil) through normal drill seeding methods.
- (2) "Consistent ground freeze" is the time during the fall months in which the surface soil (topsoil), due to freeze conditions, prevents burying the seed ½ inch through normal drill seeding operations. The Contractor shall not sow, drill, hydraulically apply, or plant seed when the surface soil or topsoil is in a frozen or crusted state.

The Engineer, with coordination from the Region Landscape Architect, will approve seeding outside the seeding seasons only when requested in writing. If requested by the Contractor, the Contractor must agree to perform the following work at no cost to the Department: reseed, remulch, and repair areas that fail to produce species indicated in the Contract.

If the Engineer orders seeding outside the seeding seasons listed above, the cost to repair areas that fail to produce species will be paid for by the Department.

**212.05 Soil Amendment and Native Seeding Methods.** Install seeded areas in accordance with SWMP Permanent Stabilization Plan.

Apply all amendments and seeding based on the seeding method and rates specified on the plans.

Complete the Amendments Verification Prerequisite for each of the seeding methods described herein. Complete a Seed and Amendment Quantities Worksheet for each work area, listing all amendments and including seed labels. The State required legal tags shall remain on the bag until opened and the seed placed in either the drill or hydraulic seeders in the presence of the Engineer. The Engineer will provide written approval of the worksheet prior to any seeding work.

Use Pure Live Seed (PLS) weight shown on each bag of seed for determining the weight of seed required for each work area. The Engineer will not accept calculations based on net weight.

Submit a proposed Permanent Stabilization Phasing Plan to the Engineer prior to the Pre-revegetation Conference for approval. The Contractor will show how implementation of the SWMP Permanent Stabilization Plans will minimize traffic loading damage to subgrade soil prepared and seeded areas. Provide proposed sequencing, identify strategies and site management control measures to protect seeded areas from foot, vehicle, and other

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disturbances. The strategic planning of the permanent seeding and mulch shall consider all other phasing of construction activities including traffic management and utility work. Repair areas damaged due to the failure to protect the seeded areas at no cost to the Department. Repair and reseed areas damaged due to circumstances beyond the Contractor's control. Payment for corrective work shall be at the Contract prices shown and in accordance with subsection 109.04.

The Contractor shall not implement seeding application methods during the following conditions: during winds consistently higher than 20 MPH, when the ground is frozen, excessively wet. The Engineer may test to see if the moisture level in the soil is acceptable to work the soil by performing a Soil Plasticity Test as described in the Construction Manual. The Contractor shall anticipate multiple seeding operations based on acceptable seeding conditions. The Contractor shall implement one or more of the following seeding methods, as shown on the plans:

(a) *Soil Amendment and Seeding (Native) Hydraulic.*

This method utilizes water as the carrying agent and mixes biotic soil amendments, seed, humates, mycorrhizae into a single slurry for hydraulic application. The Contractor shall furnish and place combined slurry with a hydro-seeder that will maintain a continuous agitation and apply homogenous mixture through a spray nozzle. The pump shall produce enough pressure to maintain a continuous, non-fluctuating spray to reach the extremities of the seeding area. Water tanks shall have a means of measuring tank volume. Add seed to the slurry onsite, no more than 60 minutes before starting application. Apply slurry shall from a minimum of two opposing directions to achieve complete soil coverage.

The Contractor shall apply the single slurry within four hours of adding Mycorrhizae.

The Contractor shall prevent seed, soil amendments, and mulch from falling or drifting onto areas occupied by rock base, rock shoulders, plant beds, or other areas where grass is detrimental. The Contractor shall remove material that falls on plants, roadways, gravel shoulders, structures, and other surfaces not specified.

- (i) *Seedbed Preparation.* Loosen all areas to at least 6 inches, leaving the surface in rough condition with a surface variance of 6 to 8 inches. On slopes steeper than 3:1, complete tillage with appropriate equipment as the slope is constructed. Till soil areas to produce loose and friable surfaces with crusted hard soils broken up. All slopes shall be free of clods, sticks, stones, debris, concrete, asphalt and all other materials in excess of 4 inches in any dimension. All competitive, non-native vegetation shall be uprooted and hauled offsite prior to spreading amendments. Under no circumstances shall the ground surface be smooth and compacted.

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- (ii) *Biotic Soil Amendment, Humate, Mycorrhizae and Seed.* The application rate of the biotic soil amendments shall be in accordance with the rates shown on the plans. Application rate of mycorrhizae shall be 20 pounds per acre. Use mulch tackifier as a wetting agent at a rate of 30 pounds per acre. The Contractor shall assemble all materials for proposed areas to hydro-seed and review quantities with area of coverage with the Engineer as the Quantities Verification Prerequisite for this method. Prior to mixing in the tank, the Contractor shall receive written acceptance from the Engineer on the Seed and Amendment Quantities Worksheet that the correct quantities are onsite. This quantities verification prerequisite also requires documentation on the Permanent Stabilization SWMP Site Maps with the approved areas outlined, signed, and dated by the Engineer to track progress. For the verification process,

provide the Engineer with all documentation for materials in unopened packaging.

After approval of the Quantities Verification Prerequisite, the Contractor shall fill the hydro-seeder with water to 1/3 of its required volume. Add water and biotic soil amendments to the hydro-seeder at a consistent rate. The ratio of water to biotic soil amendments shall be in accordance with manufacturer's recommendations. Next, add, humates and mycorrhizae until the tank has reached 3/4 of its required volume. Fill tank with water to the required volume. Uniform slurries shall be agitated or mixed for a minimum of ten minutes after all water and materials are in the tank.

Hydraulic seeding equipment shall include a pump capable of operating at 100 gallons per minute and at 100 pounds per square inch pressure. The equipment shall have a nozzle adaptable to hydraulic seeding requirements. Storage tanks shall have a means of estimating the volume used or remaining in the tank. An appropriate curing period shall be in accordance with manufacturer's recommendations, and shall consider forecasted weather conditions.

Complete permanent stabilization mulching within 24 hours of hydraulic application of native seed.

- (b) *Soil Amendment and Seeding (Native) Broadcast.*

This method utilizes hand equipment to broadcast spread amendments and seed over prepared seedbeds.

- (i) *Humate.* Apply uniformly on the surface of the placed topsoil using an agricultural spreader at the rate of application specified on the plans. All competitive non-native vegetation shall be uprooted and hauled offsite prior to spreading amendments. Prior to starting incorporation, the Contractor shall receive the Engineer's written acceptance on the Seed and Amendment Quantities Worksheet. The Quantities Verification Prerequisite for this method also requires documentation on the Permanent Stabilization SWMP Site Maps with the approved areas outlined, signed, and dated by the Engineer to track progress.

Once the Quantities Verification Prerequisite is complete for an area, the Contractor shall homogeneously incorporate the into the top 6 inches of soil. Complete tillage of the amendments using appropriate tools depending on the size of the work area. Use hand tillers or approved small space implements.

After approval of incorporation of humates uniformly on the surface of the topsoil using an agricultural spreader.

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- (ii) *Seedbed Preparation.* Amended topsoil shall be cultivated to a firm but friable seedbed using tractor implements. Crusted hard soils shall be broken up and all areas shall be free of clods, sticks, stones, debris, concrete, and asphalt in excess of four inches in any dimension in accordance with Section 207. Leave areas in a rough condition with a surface variance of 2 to 4 inches. Under no circumstances shall the ground surface be smooth and compacted.
- (iii) *Seed and Mycorrhizae.* Prior to seeding, the finished grade of the soil shall be 1 inch below the top of all curbs, junction and valve boxes, walks, drives and other structures. Application rate of mycorrhizae shall be 20 pounds per acre. Complete seeding within two days of seedbed preparation efforts (tilling or scarifying) to make additional seedbed preparation unnecessary. Re-prepare seedbed if compaction or erosion occurs in a rain event prior to seeding as directed at no additional cost to the Department.

Seed areas by broadcast-type seeders (cyclone or approved mechanical seeders). After seeding, mycorrhizae shall be evenly hand-distributed across the area. Hand rake seed and mycorrhizae and cover with ¼ to ½ inch of topsoil. To ensure seeds have a firm contact with the soil the Contractor shall use a heavy roller as approved in the Site Pre-vegetation Conference. Using equipment with continuous cleat tracks (cat-tracking) to cover seed is not permitted.

Complete permanent stabilization mulching within 24 hours of broadcast seed application of native seed.

**212.06 Application Rates:** The following application rates are to be used in table 212-9.

**Table 212-9**  
**Application Rates**

Material	Rate	Unit
Biotic Soil Amendments (Hydraulic Applied)	<b>3500</b>	<b>lbs/acre</b>
Humate	<b>200</b>	<b>lbs/acre</b>
Mycorrhizae [seeding (native) hydraulic]	<b>20</b>	<b>lbs/acre</b>
Mycorrhizae [seeding (native) broadcast]	<b>20</b>	<b>lbs/acre</b>
Seeding (Native) Hydraulic	<b>See SWMP</b>	<b>lbs/acre</b>
Seeding (Native) Broadcast	<b>See SWMP</b>	<b>lbs/acre</b>

**METHOD OF MEASUREMENT**

**212.07** The quantities of native seeding types (hydraulic or broadcast) will not be measured but shall be the quantities designated in the Contract, except that measurements will be made for revisions requested by the Engineer, or for discrepancies of plus or minus five percent of the total quantity designated in the Contract.

Humates, Mycorrhizae Soil Amendments for Seeding (Native) method, hydraulic, and broadcast will be measured by the actual quantity of material applied and accepted.

Measurement for acres will be by slope distances.

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**BASIS OF PAYMENT**

**212.08** The accepted quantities of, native seeding will be paid for at the contract unit price for each of the pay items listed below that appear in the bid schedule. The Contractor shall re-order rejected seed stored longer than 30 days at their expense.

Payment will be made under:

Item Code	Pay Item	Pay Unit
212-00702	<b>Biotic Soil Amendments (Hydraulic Applied)</b>	Pound
212-00703	<b>Humate</b>	Pound
212-00704	<b>Mycorrhizae</b>	Pound
212-00707	<b>Seeding (Native) Hydraulic</b>	Acre
212-00708	<b>Seeding (Native) Broadcast</b>	Acre

Calibrating, adjusting, or readjusting seeding or fertilizing equipment will not be measured and paid for separately but shall be included in the work.

No additional cost will be accepted for approved substitution of specified seed mix.

No payment will be made for areas seeded using one of the seeding methods without receiving signed Seed and Amendment Quantities Worksheet from the Engineer.

Additional seedbed preparation prior to seeding to correct compaction or erosion from storm events will not be measured and paid for separately but shall be included in the work.

Additional mobilizations as needed to complete seeding within allowed seeding seasons will not be measured and paid for separately but shall be included in the work.

Removal of all competitive, non-native vegetation prior to spreading amendments will not be measured and paid for separately but shall be included in the work.

## **REVISION OF SECTION 214 NURSERY STOCK CONTAINERS**

Delete and replace Section 214 of the Standard Specifications with the following:

### **DESCRIPTION**

**214.01** This work consists of furnishing all plants, labor, materials and equipment to install woody plant material, hereinafter referred to as “nursery stock”.

All approvals and direction required from the Engineer in this specification will involve the Engineer working directly with Region or Headquarters Environmental Staff, as identified in the Contract.

### **MATERIALS**

**214.02** Nursery Stock shall be of the minimum sizes and species as designated on the plans, in healthy condition with normal well-developed branch and root systems, and shall conform to the requirements of the *American Standard for Nursery Stock* (ANSI Z60.1-2014). For specified deep rooted container stock the container class volume ranges shall be substituted with the requirements of this specification. See subsection 1.1.3.3 of the American Standard for Nursery Stock regarding unclassified containers.

All nursery stock shall be free from plant diseases and insect pests. All shipments of plants shall comply with all nursery inspection and plant quarantine regulations of the State of origin and destination, and the Federal regulations governing Interstate movement of nursery stock. The Contractor shall submit proof of deposit that nursery stock, Contract species and Contract quantity have been secured 30 days post Environmental Pre-Construction Conference. For multi-year projects (two or more continuous years) the contractor shall submit a schedule for approval documenting when proof of deposits on nursery stock will be provided.

The minimum acceptable sizes of all nursery stock, with branches in normal position, shall conform to the measurements specified in the Landscape/Mitigation Plans.

Hardiness zones are defined in U.S. Department of Agriculture (USDA) 2012 Plant Hardiness Zone Map publications. Only Nursery Stock rated for USDA Hardiness Zones 2, 3, 4, and 5 will be accepted.

Plants shall be nursery grown for at least one growing season, or plants that have established themselves in accordance with definitions set forth in the Colorado Nursery Act, Title 35, Article 26, CRS.

No species substitutions are permitted without written approval. If nursery stock of acceptable quality and specified variety or size are not available, before any species substitutions will be approved the Contractor shall supply to the Engineer three written letters from nurseries verifying that a species or plant size is not available. Once three letters are provided, the Contractor Shall with Engineer’s written approval:

- (1) Substitute acceptable nursery stock that are larger than specified at no change in Contract price. For deep rooted nursery stock, the minimum depth requirement of the container must be maintained as stated in this specification.
- (2) Substitute smaller plants than those specified on the Landscape/Mitigation Plans at the adjusted price or ratio stated in the written approval.



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(3) Substitute of plants of different genus, species or variety shall be submitted to the Engineer for approval 30 days prior to installation at the adjusted price stated in the written request.

At the Environmental Pre-construction Conference, the Contractor shall name the nursery stock supplier for all items. Nursery stock will be rejected for not meeting the Contract at any of the four following times and locations:

- (1) At the nursery stock supplier's location during inspection. The Engineer will notify the contractor when the nursery stock will be inspected.
- (2) On the project site at the time of delivery, prior to planting.
- (3) At the time of installation.
- (4) At the partial or final acceptance walkthroughs on the project site.

Plant materials supplied by the Contractor shall be inspected by the Engineer at the growing site and tagged or otherwise approved for delivery. Inspection at nursery does not preclude right of rejection at construction site. Contractor shall remove rejected materials immediately from the site at Contractors expense. The Contractor shall ensure that all nursery materials meet the requirements of this Section prior to delivery.

Proposed materials shall be flagged at the nurseries by the Contractor prior to viewing by the Engineer. The Contractor shall schedule with the Engineer a time for viewing plant material at the nursery. Trips to nurseries shall be efficiently arranged to allow Engineer to maximize their viewing time. A minimum of two weeks shall be allowed for this viewing prior to time that plants are to be dug. When requested by the Engineer photographs of plant material or representative samples of plants shall be submitted. Viewing of plant materials by the Engineer at the nursery does not preclude their right to reject material at the site of planting.

The Contractor shall notify the Engineer at least three working days in advance of the anticipated delivery date of any plant material. The Contractor shall submit an invoice for each shipment of plants showing the quantities, kinds, and sizes of materials along with the certificate of inspection. Evidence of inadequate protection of plant material following digging, transit, storage or other handling will be cause for rejection. Upon arrival at the temporary storage location or work site, plants shall be inspected for proper handling (including but not limited to shipping procedures) in the presence of the Engineer for damage, including but not limited to dried out roots, broken branches, broken or loosened root balls, or torn bark. The Contractor shall replace the damaged material at their own expense.

Container grown nursery stock shall have a well-established root system reaching the sides and bottom of the container to provide a firm mass of growing medium, but shall not be root bound (i.e. have excessive root growth encircling the inside of the container). Bare root material will not be accepted as a substitution for nursery stock specified as container or balled and burlapped specified nursery stock.

Each species shall be identified by means of grower's label affixed to the plant. The grower's label shall include the data necessary to indicate conformance to specifications. For minimum plant requirements of height, width, minimum multi stems and root ball diameter as appropriate for the specified species type see the Plant Schedule on the Plans.

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(a) *Nursery stock.* Contractor shall file copies of certificates after acceptance of material. Evidence of inadequate protection following digging, carelessness while in transit, or improper handling or storage, will be cause for rejection. When a plant has been rejected, the Contractor shall remove it from the area of the work and replace it with one of the required size and quality conforming to one of the following:

(1) Deep Rooted Containers (DRC) shall be containers for growing native plants that are narrower in diameter and longer than standard nursery pots of equal volume. Containers must have physical “anti-spiraling” features such as vertical ribs on the inside walls or side slits in the sidewalls that will air-prune roots. Containers that have been treated with compounds such a copper to chemically prune the roots will not be accepted. Deep rooted container classifications shall have the following properties:

<b>Deep Rooted Container Class Specification</b>	<b>Minimum Height (Inches)</b>	<b>Minimum Volume (Cubic Inches)</b>
DRC #10	8	10
DRC #40	9	40
DRC #60	13	60
DRC #180	14	180
DRC #300	29	300

(2) Standard Nursery Practice Containers (SNC) shall conform to the recommended specification in the *American Standard for Nursery Stock* (ANSI Z60.1-2014). For minimum plant requirements of height or width as appropriate for the specified species type see the Plant List on the drawings. SNC classifications shall have the following properties:

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Standard Container Class Specification	Acceptable Volume Range (Cubic Inches)
#1	152-251
#5	785-1242
#10	2080-2646
#20	4520-5152

(3) Balled and burlapped or large container shall conform to the recommended specifications in the *American Standard for Nursery Stock* (ANSI Z60.1-2014). Single stem deciduous tree caliper measurements shall be taken six inches above the ground for field grown stock and from soil line for container grown stock. Multi-stem deciduous tree and evergreen tree height measurement shall be from ground level for field grown and from soil line for container grown stock

(b) *Backfill*. Backfill material consists of topsoil in accordance with the Contract requirements of 207 and additional compost material thoroughly mixed together and reasonably free of rocks and plant material. All other foreign material shall be removed. Do not use subsoil removed from planting pits as backfill unless accepted by CDOT Project Engineer. Compost shall be mixed into the backfill material at a rate of 25 percent by volume.

Compost for planting pits shall be in accordance with section 212.

(c) *Wood Mulch*. Mulch shall consist of virgin moist wood product with shavings having approximate dimensions of: Width: ¼ to ½ inch, Length 3 to 4 inches. Mulch shall be free of material injurious to plant growth. Sources of mulch should be free of weeds and invasive plant parts or seeds. Sawdust, dirt, garbage, or other debris mixed in the mulch is not acceptable. Contractor shall submit one pound of proposed mulch for approval.

**CONSTRUCTION REQUIREMENTS**

**214.03 Initial Planting.** All nursery stock shall be protected from drying out or other injury with acceptable practices within the industry. Broken and damaged roots shall be pruned before planting.

(a) *Planting Seasons*. Nursery stock shall be planted in accordance with the Contract. Nursery stock shall be planted during the growing season between May 15<sup>th</sup> – July 31<sup>st</sup> or September 15<sup>th</sup> – October 31<sup>st</sup> and not during periods of excessive heat or drought unless approved by the Engineer or Region Biologist.

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Areas to be planted shall be brought to the lines and grades designated or approved. The Contractor shall place all plant material according to the approved Landscape/Mitigation Plans to the degree that unsuitable planting locations shall be avoided. Trees shall be planted outside of the clear zone, except when guardrail or vertical curb exists, this distance may be reduced to 20 feet. Shrubs shall not be planted closer than 6 feet from the edge of pavement. Locations of all nursery stock be staked in the field prior to planting. Plants and planting locations shall be checked in the field by CDOT Region Biologist or CDOT Landscape Architect and shall be adjusted to the position as approved before planting begins. Planting holes shall not be constructed until written approval has been received from the Engineer.

(b) *Excavation.* Planting pits shall be circular in outline with vertical or sloped sides. The Contractor shall roughen sides of the pit to remove any compacting or glazing. When conditions detrimental to plant growth are encountered, such as over compacted topsoil, rubble fill, debris, or obstructions, notify the Engineer before planting. Use of a tree spade to dig plant pits is prohibited.

(c) *Planting.* Planting shall be done in accordance with good horticultural practices and only after topsoil has been placed. Plants of upright growth shall be set plumb and plants of prostrate type shall be set normal to the ground surface. Plants with dry, broken, or crumbling roots will not be accepted for planting. When conditions detrimental to plant growth are encountered, such as over compacted topsoil, rubble fill, debris, or obstructions, notify the Engineer before planting. Use of a tree spade to dig plant pits is prohibited. Pits excavated with a backhoe shall be scarified as needed.

In non-irrigated areas, planting pits shall be dug so that the top of the rootball is 2-4 inches depressed from surrounding final grades. The nursery stock shall be set in the center of the planting pit on undisturbed soil.

Shrubs shall be planted in the center of the pit. All of the plastic, metal and fabric, containers shall be removed. Peat containers shall be removed if directed by the Engineer. If the nursery stock is root-bound (roots circle the root ball) shallow scores with a sharp knife ¼ to ½ inch deep shall be made along the edges and the bottom of the rootball.

(d) *Backfilling.* Backfill shall be thoroughly worked and watered-in to eliminate air pockets.. After the soil has settled, nursery stock must be in the proper position and at the proper depth. Saucers shall be prepared around each plant to the dimensions shown on the planting details. For all nursery stock the excavated area shall be covered with a 4-inch-thick layer of wood mulch. After completion of all planting and before acceptance of the work, the Contractor shall water nursery stock installed under this Contract, as needed to maintain a moist root zone optimum for plant growth. Nursery stock or prepared surfaces damaged during planting operations by the Contractor's operations shall be replaced at the Contractor's expense.

Surplus soil remaining after backfilling is completed shall be used for constructing water retention berms, or, if not needed for berms, shall be thinly distributed (wasted) in the vicinity, subject to approval of the Engineer.

(e) *Wood Mulch.* Mulch shall be placed to a minimum of 4-inch depth to cover nursery stock excavated areas, but not touching the trunk of trees.

(f) *Pruning.* All deciduous trees and shrubs shall be pruned in accordance with standard horticultural practice, preserving the natural character of the plant. Guidelines for pruning are indicated in the planting

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details. Pruning cuts shall be made with sharp clean tools. All clippings shall become the property of the Contractor and be removed from the site.

(g) *Watering.* Watering in newly planted nursery stock in non-irrigated areas. The Contractor shall furnish and supply the correct amount of water to the area receiving unrooted cuttings and nursery stock to keep the plants in a healthy and vigorous condition. All plantings shall be watered within four hours of placement. All plant material shown on the plans (excluding seeded areas) shall be watered to ensure successful establishment of the plant. Rate of flow shall allow the water to soak into the soil adjacent to the planting. At no time shall watering operations be applied at a rate or intensity that causes surface run off.

(h) *Maintenance of landscape during construction.* Maintenance of landscaping shall start immediately upon placement of first permanent landscaping and continue until the Notice of Substantial Landscape Completion has been received. The Contractor shall maintain the seeded areas, nursery stock and unrooted cuttings in a healthy and vigorous growing condition to ensure successful establishment. Maintenance shall consist of the following:

- a. All plant material shown on the plans (excluding seeded areas) shall be watered to ensure successful establishment of the plant.
- b. Shrubs shall be watered twice a month for the months of May through October, and once per month for the months of November through April. Rate of flow must allow the water to soak into the soil adjacent to the planting. At no time shall watering operations be applied at a rate or intensity that causes surface run off.

**214.04 Landscape Establishment and Maintenance.** From the time of installation, during construction, and throughout the Landscape Establishment period the Contractor shall maintain all plant material and seeded areas in a healthy and vigorous growing condition, and ensure the successful establishment of vegetation. This includes performing establishment, replacement work, and landscape maintenance work as described below.

(a) *Nursery Stock Warranty Period.* After all landscaping work in the Contract has been installed and completed, a Substantial Landscape Completion Inspection shall be held including the Contractor, Engineer and the Region Environmental Staff to determine acceptability of the landscaping work. During the inspection, an inventory of rejected material will be made, and corrective and necessary cleanup measures will be determined. The approval of the Notice of Substantial Landscape Completion will take place upon successful removal of rejected material and required cleanup measures. The beginning of the Nursery Stock Warranty Period depends upon the time the receipt from the Engineer of a written Notice of Substantial Landscape Completion is issued. If the Notice of Substantial Landscape Completion is issued between March 20 and June 21, the Nursery Stock Warranty Period begins immediately and lasts for a period of 12 months. If the Notice of Substantial Landscape Completion is issued prior to this time (January 1 through March 19), Nursery Stock Warranty begins on March 20 of that year and lasts for the remaining months until March 20 of the following year. If the Notice of Substantial Landscape Completion is issued after this time (June 22 through December 31), the Nursery Stock Warranty Period begins on March 20 of the following year and lasts for a period of 12 months. Variations to these dates are permitted, and shall be as directed.

Dead, dying, or rejected material shall be removed each month during the Nursery Stock Warranty Period as directed. DRC #10 and SNC #1 along with all larger nursery stock container sizes shall be replaced only one time during the spring calendar dates as shown above. Nursery stock containers smaller than DRC #10 and

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SNC #1 along with seeding and unrooted cuttings will not be included in Nursery Stock Warranty Period. Nursery Stock replacements shall be planted in accordance with the Contract and shall be subject to all requirements specified for the original material.

Contractor access to private property for nursery stock replacement work will not be extended beyond the terms of the temporary construction easement(s) for the project, unless another temporary easement agreement or extension of the original temporary easement is granted.

The contract performance and payment bond, as required in subsection 103.03, shall include all required work involved during the Nursery Stock Warranty Period.

(b) *Extended Landscape Preservation.* The Contractor shall perform landscape establishment work, described below, for a period of 12 months starting immediately after receiving acceptance of the Notice of Substantial Landscape Completion.

Prior to the Notice of Substantial Landscape Completion, the Contractor shall submit a detailed maintenance plan which includes a schedule showing the number of hours or days personnel will be present, the type of work to be performed, supervision, equipment and supplies to be used, emergency program and responsible person to contact for emergency work, and inspection schedule. The detailed maintenance plan is subject to review and approval by the Engineer. The Engineer will not issue the Notice of Substantial Completion until the Engineer has received and approved the maintenance plan.

The Contractor shall keep a project diary documenting all landscape maintenance activities including work locations and time spent. The Contractor shall provide copies of the diary to the Engineer upon request.

The Contractor shall restore and reseed eroded areas and areas of poor establishment in accordance with Sections 212 and 213.

During the Extended Landscape Preservation period, the Contractor shall water, cultivate, and prune the plants as required or directed by the Engineer. The Contractor shall reshape plant saucers, repair washouts and gullies, replace lost wood chip mulch, keep all planting sites free from weeds and do other work necessary to maintain the plants in a healthy and vigorous growing condition. Watering requirements are as follows:

(1) Shrubs planted shall be watered twice per month by the Contractor at the rate of 10 gallons per diameter inch for the months May through October, and shall be watered once per month at the rate of 10 gallons per diameter inch for the months November through April of the 12-month period following planting. The contract performance bond, required by subsection 103.03, shall guarantee replacement work during the plant establishment period. If all other work is completed on a project, no contract time will be charged during the plant establishment period.

(c) *Final Acceptance.* Upon completion of the 12-month Extended Landscape Preservation period, the Contractor shall request a walkthrough of the project site. The walkthrough shall include the Engineer, the designated representative of the Contractor, and Region Wetland Biologist. During the inspection, the Engineer will identify on a punch list any necessary repairs or replacements-

At the end of the Extended Landscape Preservation period, all plants and plantings shall be healthy and in flourishing condition, free of dying branches and branch tips.

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At the end of the Extended Landscape Preservation period, no areas shall contain 'A' list noxious weeds and no more than 10% (by individual plant density) 'B or C' list noxious weeds growing on the project.

All temporary access and routes shall be reclaimed and seeded in accordance with contract seeding and planting requirements.

Upon completion and re-inspection of final repairs and/or replacements, the Engineer will issue a *notice of final acceptance of the landscape establishment period*.

**METHOD OF MEASUREMENT**

**214.05** The quantity of nursery stock to be measured will be the number of plants, of the types and sizes designated in the Contract that are actually planted and accepted.

**BASIS OF PAYMENT**

**214.06** The accepted quantities of nursery stock and unrooted cuttings will be paid for at the contract unit price for each of the items listed below:

Payment for the total cost of the item will be made at the completion of the installation of each item.

Cost of the performance bond shall be included in the cost of the plant items.

Payment will be made under:

<b>Pay Item</b>	<b>Pay Unit</b>
Nursery Stock Container (SNC #1)	Each
Extended Landscape Preservation	LS

Nursery Stock Warranty Period will not be measured and paid for separately, but shall be included in the work. All costs associated with replacing nursery stock larger than DRC#10 and SNC #1 shall be at the Contractor's expense.

Compost required for backfill of nursery stock will not be paid for separately, but shall be included in the work.

Mulching required for planting nursery stock will not be paid for separately, but shall be included in the work.

Water used for Landscape Establishment will not be measured and paid for separately, but shall be included in the work.

Herbicide will be measured and paid for in accordance with Section 217.

Seeding will be measured and paid for in accordance with Section 212 and Topsoil will be measured and paid for in accordance with Section 207.

Maintenance or replacement control measures shall be measured and paid for in accordance with Section 208.

Mobilization required for Landscape Establishment Period will not be measured and paid for separately, but shall be included in the work.

**REVISION OF SECTION 217  
 HERBICIDE TREATMENT**

Section 217 of the Standard Specifications is hereby revised for the project as follows:

**DESCRIPTION**

Delete Subsection 217.01 and replace it with the following:

All areas to be disturbed within the project area, regardless of final disposition, shall be treated with herbicide before disturbance. After seeding and near the end of the project, if noxious weed species persist, seeded areas shall receive an additional application of herbicide. All applications shall target noxious weeds designated by the Colorado Department of Agriculture including List A, B, and C species. Recommended treatments for noxious weeds identified in the project area are summarized in the following table. Additional recommended treatments for noxious weeds including those not listed in the table below, can be found on the Colorado Department of Agriculture’s website at <https://www.colorado.gov/pacific/agconservation/noxious-weed-species>

Noxious Weed	Plant Growth Characteristics	State List <sup>1</sup>	Recommended Treatments
Canada thistle ( <i>Cirsium arvense</i> )	Aggressive rhizomatous perennial of moist/wet sites; seeds and plant parts easily transported by construction equipment.	B	<b>Mechanical Control:</b> Due to the species’ extensive root system, hand-pulling and tilling stimulate the growth of new plants and are not recommended. Mowing every 10 to 21 days during the growing season can be effective. <b>Herbicide Control:</b> Aminopyralid (Milestone), Clopyralid + Triclopyr, Amiocyclopyrachlor + chlorosulfur, or Picloram applied in spring before flowering and/or during fall regrowth. <b>Cultural Control:</b> Reseed with native seed mix and prevent bare ground.
Common mullein ( <i>Verbascum Thapsus</i> )	Biennial forb. The first year of the plant it produces a basal rosette. In spring of the second year, the plant bolts an erect stem that grows 2 to 6 feet tall. The plant has a deep taproot along with a fibrous root system.	C	<b>Mechanical:</b> Hand pull or dig when soil is moist prior to flowering/seed production. If flowers are present, bag specimens carefully so as not to scatter seeds. <b>Herbicide Control:</b> Chlorosulfuron, 2,4D, Picloram, or Metsulfuron applied to rosettes in spring or fall. <b>Cultural Control:</b> Reseed with native seed mix in fall to compete with grass in spring..
Common teasel ( <i>Dipsacus fullonum</i> )	Biennial or short-lived perennial forb that can grow to over 6 feet tall and has a tap root. Flowers from April to September and reproduces by seed. Invasive in moist soils.	B	<b>Mechanical Control:</b> Sever roots below the soil surface during the first year before the plant stores energy, and in the second year before seed production. <b>Herbicide Control:</b> Mesulfuron (Escort XP), Aminopyralid (Milestone), or Imazapic (Plateau). Apply when in rosette (spring or fall) or bolting growth stage (early summer). <b>Cultural Control:</b> Reseed with native seed mix and prevent bare ground.
Dalmatian toadflax ( <i>Linaria dalmatica &amp; genistifolia</i> )	Perennial forb introduced from the Mediterranean region. Reproduces by seed an by extensive, creeping	B	<b>Mechanical:</b> Pulling can be effective for small infestations. <b>Herbicide Control:</b> Aminocyclopyrachlor + chlorsulfuron OR picloram applied when flowering in spring and/or in fall regrowth.



	rhizomes. Grows to 3 feet and has bright yellow snapdragon-like flowers with an orange throat on elongated racemes.		<b>Cultural control:</b> Plant competitive grasses such as thickspike wheatgrass and streambank wheatgrass. The combination of herbicide spraying and seeding competitive grasses controls species better than spraying alone.
Diffuse knapweed ( <i>Cenaurea diffusa</i> )	Biennial forb that reproduces solely by seed. During the first year of growth, appears as a rosette in spring or fall. During the second year in mid to late spring – the stem bolts, flowers, sets seed, and the plant dies. Once the plant dries up, it breaks off at ground level and becomes a tumbleweed which disperses the still viable seeds over long distances.	B	<b>Mechanical Control:</b> Sever the root below the soil surface. Mowing is most effective when plants are at full bloom. <b>Herbicide Control:</b> Aminocyclopyrachlor + chlorsulfuron: preemergence or from seedling to mid-rosette state. Aminopyralid: Spring at rosette to early bot state and/or in fall to rosettes. Clopyralid: Apply to spring/fall rosettes beore flowering stalk lengthens. <b>Cultural Control:</b> Reseed with native seed mix and prevent bare ground.
Hoary cress ( <i>Lepidium draba</i> )	Creeping perennial that is a member of the mustard family and native to Europe. The leaves are alternate and are ¾ to 4 inches long. Numerous small, white flowers with 4 petals on stalks radiating from a stem.	B	<b>Mechanical Control:</b> Mow repeatedly during the summer, then apply an herbicide in the fall. <b>Herbicide Control:</b> Chlorsulfuron or metsulfuron applied at flowering (early spring to early summer) or imazapic applied at late flower to post-flower growth stage (late spring to mid-summer). <b>Cultural Control:</b> Reseed with native seed mix
Leafy spurge ( <i>Euphorbia esula</i> )	Deep-rooted perennial forb that spreads by both seed and extensive creeping roots. Emerges in early spring.	B	<b>Mechanical Control:</b> Hand pulling is not a viable option. Repeated mowing provides little long-term control <b>Herbicide Control:</b> Aminocyclopyrachlor + chlorsulfuron (Persepective) and Diflufenzopyr +dicamba (Overdrive, Distinct): apply in spring and/or fall <b>Cultural Control:</b> Reseed with native seed mix
Musk thistle ( <i>Carduus nutans</i> )	Aggressive biennial weed that produces only from seed. Typically produces rosette in first year of growth then flowers and produces seed in second year.	B	<b>Mechanical Control:</b> sever the root below the soil surface. Mowing is most effective when plants are at full bloom. <b>Herbicide Control:</b> Aminopyralis, Metsulfuron, or Chlorsulfuron primarily in spring. Aminopyralis and Cloyralid can be used on fall rosettes. <b>Cultural Control:</b> Reseed with native seed mix.
Russian olive ( <i>Elaeagnus angustifolia</i> )	Deciduous tree with a deep tap root.	B	<b>Herbicide and Mechanical Control:</b> Cut the trunks and apply herbicide applications of Triclopyr or Glyphosate to cut trunks or cut stems. Treat seedlings in spring with picloram, dicamba or glyphosphate in combination with mechanical control. Triclopyr + Aminopyralid can be use as foliar treatment ay to September. <b>Cultural Control:</b> Replant with native cottonwoods or willows with native grasses.
Scotch thistle ( <i>Onopardum acanthium</i> )	Large thistle grows to 12 feet tall. Extremely spiny. During the second year in mid to late spring the stem bolts, flowers, sets seed, and the plant dies. A prolific	B	<b>Mechanical Control:</b> sever the root below the soil surface. Mowing is most effective when plants are at full bloom. <b>Herbicide Control:</b> Aminopyralid, Chlorosulfuron, Mesulfuron + Chlorosulfuron, Clopyralid, or Aminocyclopyrachlor _ Chlorosufuron during rosette stage.

	seed producer, Scotch thistle can produce up to 14,000 seeds per plant.		<b>Cultural Control:</b> Reseed with native seed mix.
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**List A** Species in Colorado that are designated by the Commissioner for eradication.

**List B** Species are species for which the Commissioner, in consultation with the state noxious weed advisory committee, local governments, and other interested parties, develops and implements state noxious weed management plans designed to stop the continued spread of these species.

**List C** Species are species for which the Commissioner, in consultation with the state noxious weed advisory committee, local governments, and other interested parties, will develop and implement state noxious weed management plans designed to support the efforts of local governing bodies to facilitate more effective integrated weed management on private and public lands.

*Dicamba may injure woody plants.*

*Glyphosate may be used in riparian areas*

*2,4-D and Transline should not be used in riparian areas or near water.*

*Picloram is persistent in the soil and should not be used in areas to be re-seeded.*

### CONSTRUCTION REQUIREMENTS

Section 217.03 shall include the following:

The Contractor shall comply with the following best management practices in all construction areas to prevent the spread of noxious weeds and minimize potential effects from treatment:

- Minimization of soil disturbance to the greatest extent possible
- Clean all construction-related equipment thoroughly before off-loading at the project site and after working with weed-contaminated soils
- Coordination of weed management efforts with adjacent landowners to the extent possible
- Avoidance of non-target injury to passing pedestrians and motorists, adjacent native plant communities, landscaping, sensitive wildlife habitat (prairie dogs), and nearby beekeeping operations (if present)
- Herbicides can be used immediately adjacent to wetlands, riparian areas, and/or water bodies only if the label indicates its use is appropriate for such areas
- Application of herbicides immediately adjacent to active prairie dog colonies will not be permitted
- Noxious weeds observed in and near the construction area will be treated with herbicides or mechanically removed prior to the start of construction to minimize spread
- Monitor all areas treated for noxious weeds during construction and re-treat, if necessary, to prevent re-establishment of noxious weeds

Delete the last paragraph in Subsection 217.03, “Herbicides shall not be...”

### METHOD OF MEASUREMENT

Delete Subsection 217.04 and replace it with the following:

Herbicide Treatment shall be measured by the number of person-hours required to apply herbicide, as approved by the Engineer.

Mechanical control shall be included in the cost of Clearing and Grubbing.

Seeding shall be included in the cost of 212 Seeding (Native).

**BASIS OF PAYMENT**

Section 217.05 shall include the following:

Payment shall be made under:

<b>Pay Item</b>	<b>Pay Unit</b>
Herbicide Treatment	Hour

**SECTION 240**  
**PROTECTION OF MIGRATORY BIRDS**  
**BIOLOGICAL WORK PERFORMED BY THE CONTRACTOR'S BIOLOGIST**

Section 240 is hereby added to the Standard Specifications for this project as follows:

**DESCRIPTION**

**240.01** This work consists of protecting migratory birds during construction work on structures.

**MATERIALS AND CONSTRUCTION REQUIREMENTS**

**240.02** The Contractor shall schedule construction activity, including 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 or their nests protected by the Migratory Bird Treaty Act (MBTA). If construction activity is to occur between February 15 and August 31, then the following specifications must be followed and the Contractor shall retain a qualified wildlife biologist to determine where nest removal may occur or will be required during construction. The wildlife biologist shall have a minimum of three years' experience conducting migratory bird surveys and implementing the requirements of the MBTA. The Contractor shall submit documentation of the biologists' education and experience to the Engineer for acceptance. A biologist with less experience may be used by the Contractor subject to the approval of the Engineer based on review of the biologist's qualifications. If all construction activities occur after August 31 and before February 15, then the requirements set forth in this specification are not required. In Colorado, most nesting and rearing activities occur between April 1 and August 31, but raptors may nest as early as February 15.

The wildlife biologist shall record the location of each protected nest, bird species, the protection method used, and the date installed. A copy of these records will be submitted to the Engineer.

- (A) *Raptor Nest Survey.* The wildlife biologist shall conduct raptor nest surveys within 0.5 mile of the construction site prior to the start of construction. This survey can be done with binoculars. If construction activities are located within Colorado Parks and Wildlife (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 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.
- (B) *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 (raptors may nest as early as February 15). All areas scheduled for clearing and grubbing between February 15 and August 31 shall first be surveyed by the wildlife biologist within 50 feet of the work limits for active migratory bird nests, including raptors. Contractor personnel shall enter areas outside CDOT right-of-way only if a written, signed document granting permission to enter the property has been obtained from the property owner. The Contractor shall document all denials of permission to enter property. The Contractor shall avoid all 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 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.

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**SECTION 240**

**PROTECTION OF MIGRATORY BIRDS**

**BIOLOGICAL WORK PERFORMED BY THE CONTRACTOR'S BIOLOGIST**

1. *Tree and Shrub Removal or Trimming.* Tree and shrub removal or trimming shall occur before February 15 or after August 31 if possible. If tree and shrub removal or trimming will occur between February 15 and August 31, a survey for active nests shall be conducted by the wildlife biologist within the seven 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 any tree or shrub removal or trimming.

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 Engineer. 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 Engineer 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.

2. *Grasses and Other Vegetation Management.* 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 a wildlife biologist within the seven days immediately prior to ground disturbing activities.

The undisturbed ground cover to 50 feet beyond the planned disturbance, or to the right-of-way line, whichever is less, shall be maintained at a height of 6 inches or less beginning April 1 and continuing until August 31 or until the end of ground disturbance work, whichever comes first.

If birds establish a nest within the survey area, an appropriate buffer of 50 feet will be established around the nest by the wildlife biologist. This buffer dimension may be changed if determined appropriate by the wildlife biologist and approved by the Engineer. The Contractor shall install fence (plastic) at the perimeter of the buffer. Work shall not proceed within the buffer until the young have fledged or the nests have become inactive.

If the fence is knocked down or destroyed by the Contractor, the Engineer 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.

- (C) *Work on Structures.* The Contractor shall conduct 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 conduct the work on structures during the primary birding season, April 1 through August 31, unless the Contractor takes the following actions:

1. The Contractor shall remove existing nests prior to April 1. If the Contract is not awarded prior to April 1 and CDOT has removed existing nests, then the monitoring of nest building shall become the Contractor's responsibility upon Notice to Proceed.
2. 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 days for any nesting activity.
3. If the birds have started to build any nests, the nests shall be removed before they are completed. Water shall not be used to remove the nests, if nests are located within 50 feet of any surface waters.
4. 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  $\frac{3}{4}$  inch by  $\frac{3}{4}$  inch or less.

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**SECTION 240**  
**PROTECTION OF MIGRATORY BIRDS**  
**BIOLOGICAL WORK PERFORMED BY THE CONTRACTOR'S BIOLOGIST**

If an active nest becomes 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 Contractor's biologist and approved by the Engineer. The Contractor shall prevent construction activity from displacing birds after they have laid their eggs and before the young have fledged. 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. The taking of a migratory bird shall be reported to the Engineer. The Contractor shall be responsible for all penalties levied by the U. S. Fish and Wildlife Service (USFWS) for the taking of a migratory bird.

**METHOD OF MEASUREMENT**

**240.03** Wildlife Biologist will be full compensation for all work and materials required to complete the item, including wildlife biologist, wildlife survey, and documentation (record of nest location and protection method).

Clearing and grubbing will be measured and paid for in accordance with Section 201. Mowing will not be measured and paid for separately, but shall be included in the work. Removal and trimming of trees will be measured and paid for in accordance with Section 202.

Fence needed to protect migratory birds and nests will be measured and paid for in accordance with Section 607.

Netting will be measured by the square yard of material placed to keep birds from nesting on the structure. Square yards will be calculated using the length of netting measured where it is attached to the ground and the average height of the netting where it is attached to the structure.

**BASIS OF PAYMENT**

**240.04** The accepted quantities measured as provided above will be paid for at the contract unit price for each of the pay items listed below that appear in the bid schedule.

<b>Pay Item</b>	<b>Pay Unit</b>
Wildlife Biologist	Hour

**REVISION OF SECTION 304  
AGGREGATE BASE COURSE**

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 Aggregate Base Course (Class 6) as shown in subsection 703.03

The Aggregate Base Course (Class 6) must meet the gradation requirements and have a resistance value (R-value) of at least 78 when tested by the Hveem Stabilometer method.

Reclaimed asphalt pavement (RAP), asphalt millings, or asphalt in any form whatsoever shall not be substituted for or used in Aggregate Base Course (Class 6).

**REVISION OF SECTION 401  
 TOLERANCES FOR HOT MIX ASPHALT (VOIDS ACCEPTANCE)**

Section 401 of the Standard Specifications is hereby revised for this project as follows:

In subsection 401.02(b) delete Table 401-1, including the footnotes, and replace with the following:

**Table 401-1  
 Tolerances for Hot Mix Asphalt**

Element	Tolerance
Asphalt Cement Content	± 0.3 %
Voids in the Mineral Aggregate (VMA)	± 1.2 %
Air Voids	± 1.2 %
Asphalt Recycling Agent	± 0.2 %
<b><sup>1</sup>Hot Mix Asphalt – Item 403, Gradations</b>	
<sup>2</sup> Passing the 9.5 mm (3/8 inch) and larger sieves	± 6 %
<sup>2</sup> Passing the 4.75 mm (No. 4) and 2.36 mm (No. 8) sieves	± 5 %
<sup>2</sup> Passing the 600µm (No. 30) sieve	± 4 %
<sup>2</sup> Passing the 75µm (No. 200) sieve	± 2 %
<sup>1</sup> When 100% passing is designated, there shall be no tolerance. When 90-100% passing is designated, 90% shall be the minimum; no tolerance shall be used.	
<sup>2</sup> These tolerances apply to the Contractor's Process Control Testing	



**REVISION OF SECTION 403  
HOT MIX ASPHALT**

Section 403 of the Standard Specifications is hereby revised for this project as follows:

Subsection 403.02 shall include the following:

The design mix for hot mix asphalt shall conform to the following:

<b>Table 403-1</b>							
<b>Property</b>	<b>Test Method</b>	<b>Value For Grading</b>					
				SX (100)	S (100)		Patching
Air Voids, percent at: N (design)	CPL 5115			3.5 – 4.5	3.5 – 4.5		3.5 – 4.5
Lab Compaction (Revolutions): N (design)	CPL 5115			100	100		100
Stability, minimum	CPL 5106			30	30		30
Aggregate Retained on the 4.75 mm (No. 4) Sieve for S, SX and SG, and on the 2.36mm (No. 8) Sieve for ST and SF with at least 2 Mechanically Induced fractured faces, % minimum*	CP 45			60	60		60
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 64-22
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
<p>Note: AI MS-2 = Asphalt Institute Manual Series 2</p> <p>Note: Mixes with gradations having less than 40% passing the 4.75 mm (No. 4) sieve shall be approached with caution because of constructability problems.</p> <p>Note: 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 3/4" to 3/8" are considered a coarse gradation if they pass below the maximum density line at the #8 screen. Gradations for mixes with a nominal maximum aggregate size of #4 or smaller are considered a coarse gradation if they pass below the maximum density line at the #16 screen.</p> <p>*Fractured face requirements for SF may be waived by RME depending on project conditions.</p>							

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 percent below the mix design optimum. CDOT 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. CDOT 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.

**Table 403-2**

<b>Nominal Maximum Size*, mm (inches)</b>	<b>Minimum Voids in the Mineral Aggregate (VMA)</b>			
	<b>***Design Air Voids **</b>			
	<b>3.5%</b>	<b>4.0%</b>	<b>4.5%</b>	<b>5.0%</b>
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.			

The Contractor shall prepare a quality control plan outlining the steps taken to minimize segregation of HMA. This plan shall be submitted to the Engineer and approved prior to beginning the paving operations. When the Engineer determines that segregation is unacceptable, the paving shall stop and the cause of segregation shall be corrected before paving operations will be allowed to resume.

CDOT approved Warm Mix Asphalt (WMA) may be allowed on this project in accordance with CP 59. WMA mixes shall utilize additives from the CDOT Approved Products List (APL). Unique requirements for WMA design, production and acceptance testing as documented during CDOT 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.

**3**  
**REVISION OF SECTION 403**  
**HOT MIX ASPHALT**

Hot mix asphalt for patching shall conform to the gradation requirements for Hot Mix Asphalt (Grading S). All patching shall be per the direction of the Engineer.

A minimum of 1 percent hydrated lime by weight of the combined aggregate shall be added to the aggregate for all hot mix asphalt.

Subsection 403.03 shall include the following:

The Contractor shall construct the work such that all roadway pavement placed prior to the time paving operations end for the year shall be completed to the full thickness required by the plans. The Contractor's Progress Schedule shall show the methods to be used to comply with this requirement.

Delete subsection 403.05 and replace it with the following:

**403.05** The accepted quantities of hot mix asphalt will be paid for in accordance with subsection 401.22, at the contract unit price per ton for the bituminous mixture.

Payment will be made under:

<b>Pay Item</b>	<b>Pay Unit</b>
Hot Mix Asphalt (Patching)(Asphalt)	Ton
Hot Mix Asphalt (Grading S)(100)(PG 64-22)	Ton
Hot Mix Asphalt (Grading SX)(100)(PG 76-28)	Ton

Aggregate, asphalt recycling agent, asphalt cement, additives, hydrated lime, and all other work and materials necessary to complete each hot mix asphalt item will not be paid for separately, but shall be included in the unit price bid. When the pay item includes the PG binder grade, any change to the submitted mix design optimum asphalt cement content to establish production targets on the Form 43 will not be measured and paid for separately, but shall be included in the work. No additional compensation will be considered or paid for any additional asphalt cement, plant modifications and additional personnel required to produce the HMA as a result in a change to the mix design asphalt cement content.

Historically, typical asphalt cement increases reflected on the Form 43 are from 0.1 to 0.5 percent. However, the Contractor should anticipate the AC increases typical of his mixes. Contractors bidding the project should anticipate this change and factor it into their unit price bid.

When the pay item does not include the PG binder grade, asphalt cement will be measured and paid for in accordance with Section 411. Asphalt cement used in Hot Mix Asphalt (Patching) will not be measured and paid for separately, but shall be included in the work.

Excavation, preparation, and tack coat of areas to be patched will not be measured and paid for separately, but shall be included in the work.

**REVISION OF SECTION 610  
MEDIAN COVER MATERIAL (PATTERNED CONCRETE)**

Section 610 of the Standard Specifications is hereby revised on this project as follows:

Subsection 610.01 shall include the following:

This work includes the construction of Median Cover Material (Patterned Concrete) as designated in the project plans.

Subsection 610.03(b) shall include the following:

Concrete used for Median Cover Material (Patterned Concrete) shall meet the following color requirements:

Color Hardener: Cliffside Brown

Manufactured by Davis Colors, locally distributed by Martin Marietta Materials or approved equal

Color Antiquing Release: Nutmeg

Manufactured by Brickform, locally distributed by Martin Marietta Materials or approved equal

Subsection 610.04 shall include the following:

Acrylic Sealer: Arcoseal Acrylic Sealant, or approved equal

The concrete shall be patterned to approximately match the joint pattern in the existing colored patterned concrete. A 3" diameter PVC sleeve for placement of the traffic sign shall be installed in the center of the new concrete. The contractor shall provide a sample to demonstrate it matches the existing median cover material.

## **REVISION OF SECTION 613 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 Project Engineer for approval.

Electrical conduit shall be suitable for underground use and shall be Schedule 80 in the diameters, quantities and depths shown on the plans. 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.

All HDPE conduit shall be 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.

HDPE conduit used for fiber optic communications shall be orange and conduit for electrical conductors shall be red. If additional spare conduits are installed in a common trench, the additional conduits shall be blue and black with an orange stripe. PVC conduit shall be labeled to match HDPE colors.

Each conduit shall be equipped with a pull tape installed with or after all cabling for future use. The pull tape shall have a minimum tensile strength of 1800 pounds. The pull tape shall include a continuous 22 gauge tracer wire. Splices in the pull tape and tracer wire may occur inside manholes and pull boxes and shall not be permitted inside conduit. Pull tape shall be installed in conduits with electrical conductors carrying 50V or less.

A minimum 12 gauge tracer wire shall be included in at least one conduit within all conduit banks. The tracer wire shall be orange in color. In conduit banks with multiple conduits, the 12 gauge tracer wire and pull tape shall be installed in the same conduit with the fiber optic cable.

A 2-inch wide warning tape shall be provided in each conduit trench. The warning tape and lettering shall be chemically inert, resistant to acid and alkali, designed for installation underground, and be constructed of polyethylene plastic. The warning tape shall have a minimum nominal thickness of 4 mil. The warning tape shall be red with the repeated phrase "CAUTION ELECTRIC LINE BURIED BELOW" if any conduit in the trench is designated for use with electrical conductors. The warning tape shall be orange with the repeated phrase "CAUTION FIBER OPTIC CABLE BURIED BELOW" for all other trenches. The text shall be black printed in a single line.

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**REVISION OF SECTION 613  
ELECTRICAL CONDUIT**

**CONSTRUCTION REQUIREMENTS**

All conduit and fittings installation shall conform to the NEC.

Electrical Conduit (Bored) shall be HDPE and installed using a trenchless technology such as directional boring.

Electrical Conduit (Plastic) shall be PVC or HDPE and installed by direct burial methods such as plowing, open trenching, or other excavation methods.

For Electrical Conduit (Plastic) items, the contractor may select any of the trenching options provided in the typical detail in the Plans. The selected option may vary throughout the project, depending upon the conditions at each project location. The complete installation using any of the options will be paid for under the respective Electrical Conduit (Plastic) item.

Prior to construction, the Contractor shall submit a trenching and boring plan to the Engineer for approval. 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.

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.

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 the appropriate backfill material approved by the Engineer.

The Contractor shall restore all surface materials to their original condition or better, including but not limited to pavement, sidewalks, sprinkler systems, landscaping, shrubs, sod, and native vegetation that is disturbed by the conduit installation operation. All restoration shall be included in the cost of the conduit.

The Contractor shall use corrosion resistant 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.

When conduit is trenched or plowed, warning tape shall be installed a minimum of 12 inches directly above the conduit and a minimum 12 inches below final grade.

Conduits not containing cable shall be plugged with a plug that is watertight, removable, mechanical and equipped with a connection to secure a pull rope.

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**REVISION OF SECTION 613**  
**ELECTRICAL CONDUIT**

Conduits containing cable shall be plugged with durable and reusable split type plugs, fabricated without corrosion resistant 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.

Conduit shall be plugged at all termination points including but not limited to pull boxes, manholes, controller cabinets, structures, poles, and node buildings.

All open conduit ends shall be plugged at the end of each shift with an approved plug.

All conduits shall terminate between two inches and four inches from the bottom or sides of pull boxes and manholes.

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 radius of 24 inches. HDPE conduit minimum bending radius shall conform to Table 354.24 in the NEC.

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. For locations where conduit is installed into existing pull boxes, manholes, and cabinet bases that are located in asphalt, concrete, or slope pavement, patching with asphalt, concrete or slope pavement will be required and shall be included in the cost of the conduit. The Contractor shall reseal all new conduit entries into an existing manhole with grout.

Conduit shall always enter a pull box, manhole, cabinet base and all other structure types from the direction of the run only.

A conduit bell end shall be installed on each conduit in pull boxes, manholes, cabinets, and pole bases. All conduits ends shall be free from sharp edges and burrs.

Conduits stubbing up through pole foundations shall be installed within 4 inches of the center of the caisson.

The Contractor shall refer to ITS As-Built Documentation and GPS specifications for documentation requirements.

**METHOD OF MEASUREMENT**

Electrical Conduit will be measured by the actual linear foot of conduit installed and accepted.

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.

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**REVISION OF SECTION 613**  
**ELECTRICAL CONDUIT**

**BASIS OF PAYMENT**

Electrical Conduit unit prices shall be full compensation for the work shown on the Plans and described above.

Payment will be made under:

<b>Pay Item</b>	<b>Pay Unit</b>
2 Inch Electrical Conduit (Bored)	Linear Foot
2 Inch Electrical Conduit (Plastic)	Linear Foot
3 Inch Electrical Conduit (Bored)	Linear Foot
3 Inch Electrical Conduit (Plastic)	Linear Foot



## **REVISION OF SECTION 613 PULL BOXES**

Section 614 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 at locations shown on the plans.

### **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 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 120 pounds.

Pull box removable lids shall be provided with a skid-resistant surface and have the words "CDOT COMM", "EMS MARKER EMBEDDED IN COVER" and the tier level rating cast into the surface. Pull boxes containing electrical conductors shall have the words "CDOT ELEC", "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.

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. 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 manor to completely surround the box as shown on the Plans. 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 4 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.

Pull Boxes installed on slopes 5:1 or less shall be installed with the grade of the slope. Pull Boxes installed on slopes greater than 5:1 shall include a 2 foot leveled area surrounding the apron.

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**REVISION OF SECTION 613  
PULL BOXES**

The pre-cast polymer concrete apron shall be skid-resistant non-metallic, non-conductive, and UV resistant, and shall include two lifting slots for placement in the field. The pre-cast polymer concrete apron shall be of similar nominal dimensions of the concrete apron shown on the Plans. The gap between the pre-cast polymer concrete apron and outer wall of the pull box shall be a maximum of ¼ inch.

A 5/8 inch by 8 foot long copper coated steel ground rod is required at ITS device locations.

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. Pull Box (Surface Mounted) shall be Underwriters Laboratories (UL) listed. Certification documents shall be submitted with material submittals. The hinged door shall be provided with both a weather tight seal and an aluminum hasp. A keyed lock shall be provided. Surface-mounted pull boxes shall be of the dimensions shown on the plans.

**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 met prior to the installation of granite-gravel to alleviate future settling.

Wire mesh shall be installed to completely surround the box as shown on the plans. 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 trace wire shall be attached to an individual trace point; no two 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.

Pull boxes shall be installed in areas that are easily accessible by maintenance personnel. The slope around the pull box in all directions shall not be steeper than 1:6.

For 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. The dimensions of the concrete apron shall be as shown on Plans. Pull boxes shall not be installed above the grade of the apron. The concrete apron shall have a 1 percent slope away from the top of the pull box to allow for drainage.

Pre-cast concrete aprons shall be installed per manufacturer's recommendations.

Pull Box (Surface Mounted) 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 approved by the Engineer. Surface-mounted pull boxes shall not be used for ground installations. Pull tape and tracer wire shall be installed in surface-mounted pull boxes.

**METHOD OF MEASUREMENT**

Pull Boxes will be measured by the actual number installed and accepted, and will include base, lid, lift slots, support beam, integrated location disk, integrated test points, arrow symbols, excavation, backfill, concrete apron,

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**REVISION OF SECTION 613**  
**PULL BOXES**

wire mesh, ground rod, 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.

**BASIS OF PAYMENT**

Payment will be made under:

<b>Pay Item</b>	<b>Pay Unit</b>
Type Five Pull Box	Each
Type Four Pull Box	Each
Type One Pull Box	Each

Concrete will not be measured and paid for separately, but shall be included in the cost of the pull box.

## **REVISION OF SECTION 614 CONFLICT MONITOR**

Section 614 of the Standard Specifications is hereby revised for this project to include the following:

### **DESCRIPTION**

Subsection 614.01 shall include the following:

This work consists of furnishing and installing a conflict monitor at Traffic Signal Controller Cabinet locations as shown on the plans.

### **MATERIALS**

Subsection 614.08 shall include the following:

The signal monitor unit shall be a 16-channel monitor used in Advanced Traffic Controller (ATC) output files. The unit shall have the capability to monitor the absence of red. The unit shall meet at a minimum all of the requirements of the Caltrans Transportation Electrical Equipment Specifications, March 2009 revised through Errata No. 2, December 2014 with basic fault coverage of Conflict, 24 Volts Direct Current (VDC), Watchdog, and Alternating Current (AC) line monitoring. The unit shall be compatible with Light Emitting Diode (LED) type signal displays. The signal monitor unit shall be capable of monitoring Flashing Yellow Arrow (FYA) as defined in the 2009 Manual of Uniform Traffic Control Devices (MUTCD). The unit shall be capable of two modes of user selectable FYA operation, standard output file or auxiliary output file. FYA configuration shall be user settable without the need for a software interface. Permissive diode card modification beyond standard phase allowance shall not be acceptable. The signal monitor unit shall be provided with serial communication capability (Electronic Industries Alliance-232 (EIA-232) Port (9-pin)) and Ethernet port for diagnostic access. The signal monitor unit shall maintain a non-volatile event log of at least 100 fault events indicating the complete intersection status as well as AC line events, configuration changes, monitor resets, cabinet temperature and true root-mean-square (RMS) voltages. Each event shall be stamped with time and date. Data acquisition software shall be included with the monitor and shall be compatible with the latest Windows Operating System. Software updates shall be provided as available at no additional cost to the Colorado Department of Transportation (CDOT).

### **CONSTRUCTION REQUIREMENTS**

Subsection 614.10 shall include the following:

Installation of the Conflict Monitor shall be in accordance with the manufacturer's recommendation, unless otherwise directed. The Contractor shall deliver the Conflict Monitors to the Region 1 Signal Shop located at 18500 East Colfax Avenue, Aurora, CO 80011 for a period of up to two (2) weeks. CDOT will conduct bench testing. The Contractor shall be responsible for picking up the Conflict Monitors at the Region 1 Signal Shop and transporting it to the installation sites shown on the plans.

The Contractor shall remove and deliver the existing conflict monitor to the Region 1 Signal Shop in working order.

### **METHOD OF MEASUREMENT**

Subsection 614.13 shall include the following:

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**REVISION OF SECTION 614  
CONFLICT MONITOR**

Conflict Monitor will be measured by the actual number of conflict monitors installed and accepted and shall include all equipment necessary for full operation. The work shall also include the removal of the existing conflict monitor.

**BASIS OF PAYMENT**

Subsection 614.14 shall include the following:

Payment will be made under:

<b>Pay Item</b>	<b>Pay Unit</b>
Conflict Monitor	Each

Payment will be full compensation for all labor, materials, and equipment required to complete the work.

Removal and delivery of the existing conflict monitor to CDOT will not be paid for separately but shall be included in the cost of the work.

**REVISION OF SECTION 614  
RUMBLE STRIP (GRINDING)(ASPHALT)(SINUSOIDAL)**

Section 614 of the Standard Specifications is hereby revised for this project to include the following:

**DESCRIPTION**

This work consists of installing sinusoidal rumble strips by grinding the asphalt roadway pavement.

**CONSTRUCTION REQUIREMENTS**

Sinusoidal rumble strips shall be constructed to within 2 inches of the current centerline markings alignment. Rumble strip construction equipment shall be equipped with a sighting device that enables the operator to maintain the rumble strip alignment. The equipment shall also be equipped with a vacuum attachment to remove residue from the roadbed.

Indentations shall not vary from the dimensions shown on the Plans by more than 1/16 inch in depth or more than 10 percent in length and width.

Noncompliant rumble strip indentations, as determined by the Engineer, shall be removed and replaced at the Contractor's expense. Ground surface areas shall be neat and uniform in appearance to the satisfaction of the Engineer.

**METHOD OF MEASUREMENT**

Rumble Strip (Sinusoidal) will be measured by the actual number of linear feet that are installed and accepted.

**BASIS OF PAYMENT**

The accepted quantities will be paid for at the contract unit price for the pay item listed below.

Payment will be made under:

<b>Pay Item</b>	<b>Pay Unit</b>
Rumble Strip (Grinding)(Asphalt)(Sinusoidal)	Linear Foot

Payment for Rumble Strip (Grinding)(Asphalt)(Sinusoidal) will be full compensation for all work and materials required to complete the item.

**REVISION OF SECTION 614  
TRAFFIC SIGNAL CONTROLLER CABINET**

Section 614 of the Standard Specifications is hereby revised for this project as follows:

**MATERIALS**

In subsection 614.08, delete (c) and replace with the following:

(c) *Controller Cabinets*. The controller cabinet shall be a double wide Model 332 herein referred to as a Model 332D as specified in the Contract. 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:

<u>Quantity</u>	<u>Item</u>
4 each	Light Emitting Diode (LED) work light, mounted to chassis rail, 6000 Kelvin (K), Cool White, 300 lumen/foot output
4 each	Model 430 Transfer Relays
2 each	Model 204 2-Circuit Flasher (cube type, 25 ampere (A) output)
12 each.	Model 200 Load Switch (cube type, 25A output)
3 each	Model 242 Direct Current (DC) Isolators
6 each	Model 222 Loop Amplifiers
1 each.	Signal Monitor Unit with absence of red monitoring (refer to Revision of Section 614 – Conflict Monitor, paid separately from cabinet).
2 each	New York 330 Pull-out Drawer Assembly
1 each	Auxiliary Detector Termination Panel Assembly
1 each	Transient Voltage Surge Suppression System
2 each	Split Input File
1 each	Output file

Cabinet nominal dimensions: 66 inches x 49 inches x 30 inches.

Each cabinet shall have four doors and Corbin #2 Locks.

The left side of the Model 332D cabinet assembly shall have shelves attached to the Electronic Industries Alliance (EIA) rack assembly to house additional equipment such as, but not limited to, video detection, standby Uninterrupted Power Supply (UPS) and communication equipment.

The left side of the Model 332D cabinet assembly shall have pull out shelves to accommodate maintenance of the Traffic UPS batteries. The shelves for the UPS batteries shall be capable of handling the weight of the batteries plus 50 percent additional weight. The sliding shelf shall utilize ball bearing construction. The shelf shall include a rail of a minimum of 2 ½ inches to contain the batteries while sliding the shelf. These shelves shall have a double locking mechanism to prevent the shelves from moving unexpectedly in either the fully open or fully closed position. This locking mechanism shall not require any tools to operate. The cabling system between the UPS and the batteries shall be of sufficient length to accommodate the full movement of the shelf and be protected as to avoid damage while the shelf is in motion.

The cabinet shall have a silver polyester triglycidyl isocyanurate (TGIC) powder coating base. Top coating shall be anti graffiti powder paint applied at a thickness of 2.4 milliinches (mils).

The inside of the cabinet shall be painted white.

A male generator plug shall be included.

The cabinet shall be supplied with a Model 206L Power Supply Unit as detailed in Caltrans Transportation Electrical Equipment Specification (TEES) 2009.

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**REVISION OF SECTION 614  
TRAFFIC SIGNAL CONTROLLER CABINET**

The cabinet shall be supplied with a Contactor Relay to replace the Mercury Contactor Relay. The Contactor Relay shall be the same or equivalent as the Flash Transfer Relay. The Contactor Relay shall have an operating voltage of 120 Volts Alternating Current (VAC) and contacts rated for 30A minimum. The Contactor Relay shall be in the de-energized position under normal operating conditions and energized when the cabinet is in the FLASH mode. The Contactor Relay shall have an internal lamp that will be ON when the Relay is energized. The Contactor Relay shall be installed on the back of the Power Distribution Assembly. The Contactor Relay shall be easily replaced by hand and not interfere with the existing cabinet wiring harness distribution.

The cabinet shall be supplied with a 30A, 120 VAC single pole main breaker mounted on the service panel assembly. The breaker shall be supplied with a handle guard to prevent incidental contact with the handle. The handle guard shall not interfere with the handle or breaker operation.

Additional ventilation shall be comprised of two additional exhaust fans installed in the 332D cabinet as requested. The additional equipment shall be the same type as required in the specifications and controlled in the same manner.

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.

1. *Output file.* The output file shall have eight “flash programming jumper blocks,” one for each of the eight phases. The output file shall utilize 12 position terminal blocks.
2. *Split Input file.* The split input file shall be an SF 170, which will operate in the standard 332/336 cabinets. 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 National Electrical Manufacturers Associations (NEMA) Transportation Systems 1 (TS1) controllers, NEMA TS2 controllers, Model 170 controllers, and 2070 controllers.

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/Transistor-Transistor Logic (TTL) transmit and receive pairs shall be wired across the back panel. Transmit0 (TX0), Receive0 (DX0), and Ground0 serve the first eight slots; TX1, DX1 and Ground1 serve the next six slots. Backplane 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 backplane addressing. Serial connections shall use a standard quick lock connection.

3. *Transient Voltage Surge Suppression Unit.* Transient Voltage Surge Suppression (Surge Protection) shall be a solid-state device with a maximum surge current capacity of 6500 peak current amperes x 1 @ 8 X 20 microsecond wave.

The unit shall be listed to the current edition of Underwriters Laboratory (UL 1449). The enclosure is to be rated as a NEMA 1 and resistant to oil, moisture, dust and other airborne contaminants.



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**REVISION OF SECTION 614**  
**TRAFFIC SIGNAL CONTROLLER CABINET**

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). 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.

The unit shall have a failure indicator and alarm suitable for Remote Terminal Unit (RTU) connection.

The operating temperature shall be -40°C to +70°C. Electromagnetic Interference – Radio-Frequency Interference (EMI-RFI) noise attenuation to 40 decibels (dB). Capacitance shall be 1 to 1.5 microfarad per line.

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 have a retaining clip to secure the device in place.

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.

All of the above components provided, excluding the signal monitor unit, shall be on the Colorado Department of Transportation (CDOT) Approved Products list.

**BASIS OF PAYMENT**

Subsection 614.14 shall include the following:

Payment will be made under:

<b>Pay Item</b>	<b>Pay Unit</b>
Traffic Signal Controller Cabinet	Each

**REVISION OF SECTION 614  
TRAFFIC SIGNAL CONTROLLER (TYPE 2070LC)**

Section 614 of the Standard Specifications is hereby revised for this project to include the following:

**DESCRIPTION**

Subsection 614.01 shall include the following:

This work consists of the installation and testing of a Traffic Signal Controller at Traffic Signal Controller Cabinet locations as shown on the plans.

**MATERIALS**

Subsection 614.08 shall include the following:

The proposed Traffic Signal Controller shall be the Intelight 2070LC Advanced Traffic Controller, manufactured by:

Intelight, Inc.

3450 South Broadmont Drive, Suite 126

Tucson, Arizona 85713

Phone: 520-795-8808

Fax: 520-795-8811

Email: [info@intelight-its.com](mailto:info@intelight-its.com)

Website: [www.intelight-its.com](http://www.intelight-its.com)

The proposed Traffic Signal Controller shall be loaded with local controller software and the Contractor shall furnish all required firmware, firmware licensing, warranty, and support. The proposed Traffic Signal Controller shall include Manufacturer's Hardware Maintenance and Support for three years. If the manufacturer (warrantor) lists the Contractor as the warrantee, it shall be modified prior to project acceptance that the Colorado Department of Transportation (CDOT) is the warrantee and ultimate owner and user of the system. Warranties for the Traffic Signal Controller shall be provided to CDOT. CDOT will not accept the project until the warranties have been provided and transferred to CDOT.

CDOT may, at its discretion, substitute a different Traffic Signal Controller during bench testing in exchange for the proposed Intelight 2070LC. The Contractor shall then install the controller provided as directed by Jim Chase at Region 1 Traffic.

**CONSTRUCTION REQUIREMENTS**

Subsection 614.10 shall include the following:

The Contractor shall submit materials data sheets to the Engineer for approval prior to ordering equipment.

The Contractor shall submit a proposed installation schedule within five business days of receipt of the notice to proceed, which indicates when the proposed Advanced Transportation Controller (Traffic Signal Controller) will be installed, by intersection. CDOT will configure the controller in advance of the Contractor picking up the proposed Traffic Signal Controller. The Contractor shall notify the Engineer five to ten business days prior to the installation of the proposed Traffic Signal Controller in the field.

The Contractor shall deliver the Traffic Signal Controller to the Region 1 Signal Shop at 18500 East Colfax Avenue, Aurora, CO 80011 for a period of up to two weeks. CDOT will program timing databases into the Traffic

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**REVISION OF SECTION 614  
TRAFFIC SIGNAL CONTROLLER (TYPE 2070LC)**

Signal Controller and conduct bench testing. The Contractor shall be responsible for picking up the Traffic Signal Controller at the Region 1 Signal Shop and transporting it to the installation site.

The Contractor shall install the proposed Traffic Signal Controller at the intersection to which CDOT has designated it. Following the establishment of Ethernet communications to the Ethernet Switch in the cabinet, the Contractor shall establish Ethernet communications between the proposed Traffic Signal Controller and CDOT's traffic signal system software while the existing controller is online and operating the traffic signal in automatic mode, unless otherwise directed by the Engineer. The Contractor shall configure the proposed Traffic Signal Controller in conformance with the manufacturer's recommendations and communication configuration parameters provided by the Engineer.

The Contractor shall coordinate with the Engineer as necessary to establish and confirm communications. The Engineer shall verify communications to the proposed Traffic Signal Controller prior to the removal from operation of the existing controller. In the event that the Engineer cannot verify communications, the Contractor shall troubleshoot the network. If necessary, the Contractor shall work with the Engineer and CDOT Intelligent Transportation Systems (ITS) to troubleshoot the field communications from the intersection, until communications is established.

The Contractor shall re-configure the vehicle detection input cards in the traffic signal cabinet input files, to the CDOT Standard Input File Configuration shown in the special provisions. In the event that insufficient existing detector input hardware is available at the intersection to establish the standard configuration, the Contractor shall notify the Engineer immediately for direction. During the vehicle detection re-configuration, the Contractor shall program the controller operating the traffic signal to run all active phases on max recall.

Upon successful communications with the traffic signal system in this specification, the existing controller shall be removed from the cabinet and the proposed Traffic Signal Controller shall be installed in accordance with manufacturer's recommendations. The Contractor shall start up the proposed Traffic Signal Controller in accordance with CDOT Region 1 maintenance procedures.

In advance of, or immediately following, removal from the cabinet, the Contractor shall mark the existing controller to identify the intersection from which it was removed, if such markings are not already currently legible. The use of permanent marker on the side of the existing controller housing is acceptable.

When the proposed Traffic Signal Controller is installed, the Contractor shall promptly test all inputs and outputs as described in this specification.

The existing controller shall not be removed from operation until the Ethernet communications between the Traffic Signal Controller and the CDOT traffic signal system are confirmed. The existing controller shall not be removed from the project site until all inputs and outputs are as described in this specification and the Engineer accepts the local operation.

The Contractor shall connect the Traffic Signal Controller to the designated controller power outlet without the use of a power strip. The Contractor shall provide additional power strips at the locations called for in the plans.

CDOT will configure the proposed Traffic Signal Controller timing database for the inputs to be consistent with the standard vehicle detection input card configuration.

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**REVISION OF SECTION 614**  
**TRAFFIC SIGNAL CONTROLLER (TYPE 2070LC)**

Following installation of the Traffic Signal Controller, the Contractor shall verify that all inputs, including but not necessarily limited to vehicle and pedestrian detector inputs, as well as emergency vehicle and rail preemption inputs are received in the proposed traffic signal controller by the appropriate detector. In the event insufficient vehicle or pedestrian traffic is present to verify every active vehicle and pedestrian phase, the Contractor shall manually activate active vehicle or pedestrian detector inputs by driving a vehicle over vehicle detectors or pressing each pedestrian detector button in the field. The Contractor shall not use cabinet interfaces to simulate inputs from pedestrian push buttons, loops, etc.

The Contractor shall test all outputs by verifying that the inputs observed cause the proposed Traffic Signal Controller to activate the desired output.

When existing, the Contractor shall verify Emergency Vehicle Preemption (EVP) inputs and outputs by activating the EVP detectors using an authorized EVP emitter and observing a safe sequence to the dwell interval(s) and that the appropriate dwell interval(s), pedestrian interval, vehicle overlaps, blank-out signs, and advance warning flashers activate, as applicable.

The Contractor shall ensure the conflict monitor is active at all times, and the Contractor shall report any tests that trigger a conflict flash event. The Contractor shall identify and correct issues identified during the installation testing.

If directed by the Engineer due to inappropriate operation of the Traffic Signal Controller, or in the Contractor's interest of public safety, the Contractor shall re-install the same existing controller to temporarily restore acceptable traffic signal operations. In such cases, the Contractor shall notify the Engineer immediately if vehicle detectors must be placed in recall to provide normal operation.

When local operation is demonstrated and accepted by the Engineer, the Contractor shall deliver the existing controller to the Region 1 Signal Shop at 18500 East Colfax Avenue, Aurora, CO 80011 in working order.

The Contractor shall use best cable management practices to secure power and communications cables used for the proposed Traffic Signal Controller within the cabinet in a neat and workmanlike manner, while providing adequate slack at cable ends for device maintenance.

The Contractor shall also highlight the input slots being used on a CDOT Standard Input File Configuration Sheet which will be provided by CDOT with each configured Traffic Signal Controller. The Contractor shall leave the highlighted CDOT Standard Input File Configuration Sheet in each cabinet.

The Contractor shall take pictures of the front and back of each cabinet interior where a Traffic Signal Controller is installed. There shall be a minimum of four pictures taken which shall show the contents of each side of the cabinet interior. The pictures shall document the final vehicle detector input file locations. The Contractor shall also take a picture of the highlighted CDOT Standard Input File Configuration Sheet. All pictures shall be organized per location with the name of the intersection, mile point, and date and shall be submitted to the Region 1 Traffic Signal Supervisor. Pictures shall be well lit and focused.

**METHOD OF MEASUREMENT**

Subsection 614.13 shall include the following:

**4**  
**REVISION OF SECTION 614**  
**TRAFFIC SIGNAL CONTROLLER (TYPE 2070LC)**

All labor, materials, and equipment necessary for the installation of Traffic Signal Controller, including removal and salvage of the existing controller, will be measured by the number of Traffic Signal Controllers installed and accepted.

**BASIS OF PAYMENT**

Subsection 614.14 shall include the following:

Payment will be made under:

<b>Pay Item</b>	<b>Pay Unit</b>
Traffic Signal Controller (Type 2070LC)	Each

Payment will be full compensation for all labor, materials, and equipment required to complete the work.

Removal and delivery of the existing traffic signal controller to CDOT will not be paid for separately but shall be included in the cost of the work.

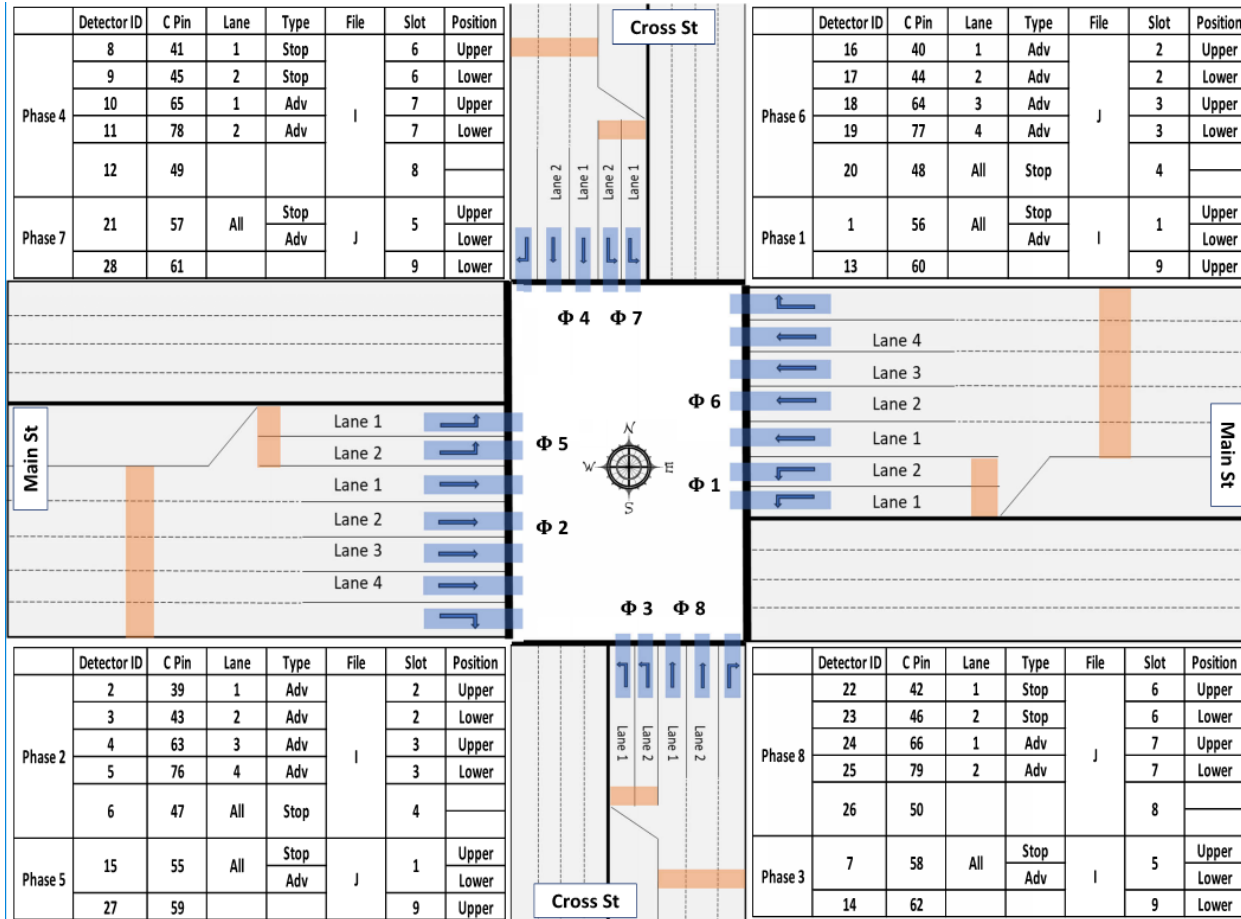
5  
**REVISION OF SECTION 614  
TRAFFIC SIGNAL CONTROLLER (TYPE 2070LC)**

CDOT STANDARD INPUT FILE CONFIGURATION

332 INPUT FILE															
SLOT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Upper	TB2-1,2	<b>Count</b>				<b>Count</b>									
	PH 1	PH 2	PH 2	PH 2	PH 3	PH 4	PH 4	PH 4	PH 1		Manual Advance	PED 2	PED 6	TB8-10,12	
	E,C	E,C	E,C	C	E,C	E,C	E,C	C	E,C					FLASH SENSE	
	Stop	ADV Lane 1	ADV Lane 3	Stop	Stop	Stop Lane 1	ADV Lane 1				***	N A			***
	D# 1	D# 2	D# 4	D# 6	D# 7	D# 8	D# 10	D# 12	D# 13				Ped#2	Ped#6	
<b>I FILE</b>	C1-56	C1-39	C1-63		C1-58	C1-41	C1-65		C1-60		C1-80	C1-67	C1-68	C1-81	
Lower	<b>Count</b>	<b>Count</b>			<b>Count</b>	<b>Count</b>									
	Ph 1	PH 2	PH 2	PH2 2	PH 3	PH 4	PH 4	PH 4	PH 3			PED 4	PED 8	*** STOP TIME	
	E,C	E,C	E	C	E,C	E,C	E	C	E,C		TB8-3 Manual Enable	TB8-5,6	TB8-8,9	TB8-11,12	
		ADV Lane 2	ADV Lane 4			Stop Lane 2	ADV Lane 2								
		D# 3	D# 5			D# 9	D# 11		D# 14				Ped#4	Ped#8	
	C1-43	C1-76	C1-47		C1-45	C1-78	C1-49	C1-62			C1-53	C1-69	C1-70	C1-82	
Upper	TB3-1,2	<b>Count</b>				<b>Count</b>									
	Ph 5	Ph 6	PH 6	PH 6	PH 7	PH 8	PH 8	PH 8	PH 5		Spare				
	E,C	E,C	E,C	C	E,C	E,C	E,C	C	E,C	***	N A	EVA	EVB	RR 1	
	Stop	ADV Lane 1	ADV Lane 3	Stop	Stop	Stop Lane 1	ADV Lane 1					2&5	4&7		
	D# 15	D# 16	D# 18	D# 20	D# 21	D# 22	D# 24	D# 26	D# 27			P# 3	P# 4	P# 1	
<b>J FILE</b>	C1-55	C1-40	C1-64		C1-57	C1-42	C1-66		C1-59		C1-54	C1-71	C1-72	C1-51	
Lower	<b>Count</b>	<b>Count</b>			<b>Count</b>	<b>Count</b>									
	Ph 5	PH 6	Ph 6	Ph 6	PH 7	Ph 8	Ph 8	Ph 8	PH 7						
	E,C	E,C	E	C	E, C	E,C	E	8 C	E,C	***	N A	EVC	EVD	RR 2	
		ADV Lane 2	ADV Lane 4			Stop Lane 2	ADV Lane 2					6&1	8&3		
		D# 17	D# 19			D# 23	D# 25		D# 28				P# 5	P# 6	P# 2
	C1-44	C1-77	C1-48		C1-46	C1-79	C1-50	C1-61			C1-75	C1-73	C1-74	C1-52	

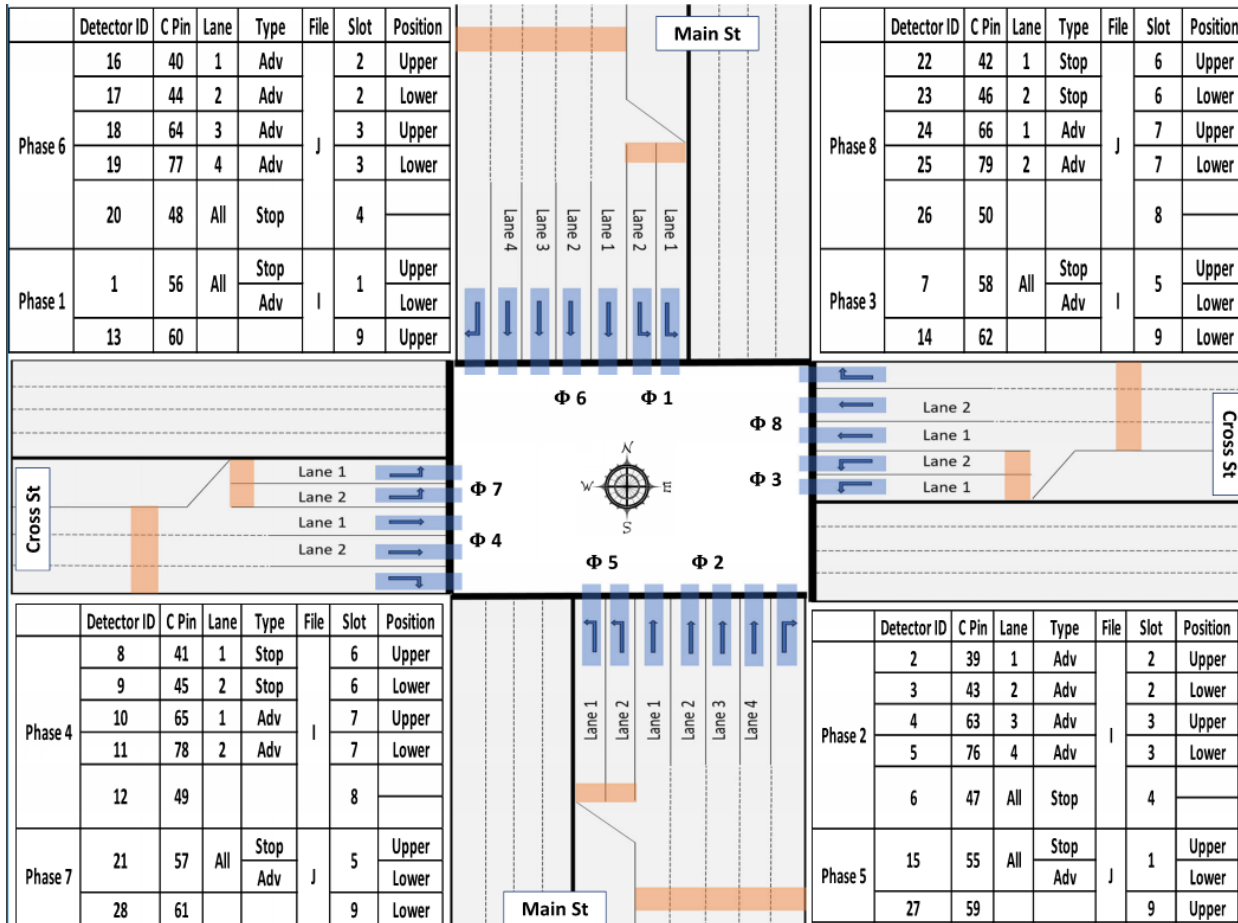
**6**  
**REVISION OF SECTION 614**  
**TRAFFIC SIGNAL CONTROLLER (TYPE 2070LC)**

**CDOT TYPICAL DETECTOR LAYOUT**



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**REVISION OF SECTION 614**  
**TRAFFIC SIGNAL CONTROLLER (TYPE 2070LC)**

CDOT TYPICAL DETECTOR LAYOUT





**REVISION OF SECTION 614  
TRAFFIC SIGNAL VEHICLE DETECTOR (STOP BAR MICROWAVE)**

Section 614 of the Standard Specifications is hereby revised for this project as follows:

**DESCRIPTION**

Subsection 614.01 shall include the following:

This work shall consist of furnishing and installing traffic signal vehicle detectors using radar in accordance with these Special Provisions at the locations shown on the Plans. Detectors shall include the following specific requirements:

1. Capable of bicycle detection.
2. Capable of being mounted on the signal pole or the mast arm.
3. Capable of detecting two approaches at a 90-degree angle with a single detector.
4. Compatible with a Synchronous Data Link Control (SDLC) cabinet interface.

The Contractor shall submit detector technical performance information meeting specification requirements to the Engineer for approval prior to placing an order for the detectors.

**MATERIALS**

Subsection 614.08 shall include the following:

The Traffic Signal Vehicle Detector (Stop Bar Microwave) sensor shall provide real-time presence data for up to ten lanes. The maximum number of zones is sixteen, and the maximum number of channels is sixteen. It shall include user-selectable zone-to-channel mapping. AND logic shall trigger the channel when all the selected zones are active; OR logic shall be used to combine multiple zones to a channel output. There shall be channel-output extend and delay functionality. Algorithms shall mitigate detections from wrong-way or cross-traffic. Fail-safe mode shall be activated for contact closure outputs if communication is lost.

The detectable range shall be 6 feet (ft) to 140 ft. The field of view shall be 90 degrees. There shall be flexible lane configuration support to account for curved lanes as well as islands and medians for up to ten lanes.

The system hardware shall include a Traffic Signal Vehicle Detector (Stop Bar Microwave) corner radar for each approach. A traffic cabinet pre-assembled backplate shall be provided with Alternating Current (AC)/Direct Current (DC) power conversion, surge suppression, terminal blocks for cable landing, communication connection points, and cabinet side mount or rack mount. Contact closure input file cards shall be provided and shall be 2 or 4 channel and be compatible with industry-standard detector racks.

The Traffic Signal Vehicle Detector (Stop Bar Microwave) shall weigh 4.2 pounds (lbs). It shall be 13.2 inches x 10.6 inches x 3.3 inches. It shall be resistant to corrosion, fungus, moisture deterioration, and ultraviolet rays. The enclosure shall be Lexan EXL polycarbonate. The outdoor weatherable shall be Underwriters Laboratories (UL) 746C. It shall be watertight by the National Electrical Manufacturers Association (NEMA) 250 standard and shall be NEMA 250 compliant for external icing (clause 5.6), hose down (clause 5.7), 4X corrosion protection (clause 5.10), and gasket (clause 5.14). It shall be able to withstand a 5-ft drop. The connector shall be Military Detail (MIL-DTL)-26482; it shall include a rotational backplate for 360 degrees of roll.

The power consumption shall be 9 watts (W). The supply voltage shall be 9-28 Voltage Direct Current (VDC). There shall be onboard surge protection.

There shall be two half-duplex Recommended Standard (RS)-485 communication ports which support dedicated detection communications and configuration, verification, or traffic display without disrupting detection communications. Firmware upgradability shall be possible over any communication port. The response delay and push port shall be user configurable

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**REVISION OF SECTION 614  
TRAFFIC SIGNAL VEHICLE DETECTOR (STOP BAR MICROWAVE)**

The radar shall operate within a frequency of 24.0 gigahertz (GHz) to 25.25 GHz (K-band). It shall include a matrix of radars, shall have no manual tuning to circuitry, and shall transmit modulated signals generated digitally. Temperature-based compensation is not necessary. The bandwidth shall be stable within 1 percent. It shall include printed circuit board antennas, and the antenna shall have a vertical 6 decibel (dB) beam width (two-way pattern) of 65 degrees. The horizontal field of view shall be 90 degrees. The antenna shall have two-way sidelobes of -40 dB. The transmit bandwidth shall be 245 megahertz (MHz). The un-windowed resolution shall be 2 ft. There shall be eight radio frequency (RF) channels. Self-testing shall be done by the radar to verify hardware functionality. There shall be a diagnostics mode available for verifying system functionality.

The Traffic Signal Vehicle Detector (Stop Bar Microwave) shall have automatic and manual configuration available for lanes, stop bars, and zones. The lane positioning increment shall be 1 ft. The configuration shall accommodate four-sided zones of any shape and size, and overlapping zones shall be supported. Sensor reconfiguration without detection disruption shall be supported. There shall be a graphical user interface with traffic pattern display. It shall include Windows Mobile®-compatible software. It shall support Windows Mobile v5.0 or greater (Socket Mobile 650-M), Windows XP, Windows Vista, and Windows 7. The software shall support TCP/IP connectivity, sensor configuration back-up and restore, viewing and editing of backed-up sensor configurations, real-time traffic visualization for performance verification and traffic display, zone and channel actuation display, virtual sensor connections for demonstration and training, and local or remote sensor firmware upgradability.

The Traffic Signal Vehicle Detector (Stop Bar Microwave) shall perform accurately in rain up to 1 inch per hour, freezing rain, snow, wind, dust, fog, changing temperature, and changing lighting (including direct light on sensor at dawn and dusk). It shall have an ambient operating temperature between -40°F and 165°F. It shall be able to operate in humidity up to 95 percent Relative Humidity (RH) (non-condensing).

The Traffic Signal Vehicle Detector (Stop Bar Microwave) shall be tested under Federal Communications Commission (FCC) Code of Federal Regulations (CFR) 47, part 15, section 15.249. Rural Call Completion (RCC) certification shall be provided on the product label, and the sensor shall remain FCC regulation-complaint for the life of the sensor.

The sensor shall be tested under International Electrotechnical Commission (IEC) 61000-4-5 class 4. The sensor shall be tested under NEMA Transportation Systems (TS) 2-2003. This testing includes:

1. Shock pulses of 10G, 11 milliseconds (ms) Half Sine Wave.
2. Vibration of 0.5G up to 30 hertz (Hz).
3. 300 volts (V) positive/negative pulses.
4. Stored at -49°F for 24 hours.
5. Stored at 185°F for 24 hours.
6. Operation at -29.2°F and 10.8 VDC.
7. Operation at -29.2°F and 26.5 VDC.
8. Operation at 165.2°F and 26.5 VDC.
9. Operation at 165.2°F and 10.8 VDC.

The Traffic Signal Vehicle Detector (Stop Bar Microwave) shall be manufactured in the USA. It shall have a surface mount assembly. It shall be Association Connecting Electronics Industries (IPC)-A-610C Class 2 compliant. Operational testing shall include a sub-assembly test, a 48-hour level burn-in, and a final unit test. Unit test results shall be available.

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**REVISION OF SECTION 614  
TRAFFIC SIGNAL VEHICLE DETECTOR (STOP BAR MICROWAVE)**

Documentation shall include instructional training guide, comprehensive user guide, installer quick-reference guide, and user quick-reference guide. Documentation upon request shall include FCC certification and IEC 61000-4-5 class 4 test report.

**CONSTRUCTION**

Subsection 614.10 shall include the following:

Cleaning, adjustment, battery replacement, and recalibration are not necessary. Mean time between failures is ten years (estimated based on manufacturing techniques).

Training shall include installation and configuration instruction to ensure accurate performance, classroom and in-field instruction, knowledgeable trainers, use of presentation materials, virtual configuration using computer playback, and instruction in use of computer and handheld devices and other necessary equipment. Tech support shall include technical representatives available for installation and configuration, and ongoing troubleshooting.

There shall be a two-year warranty against material and workmanship defects.

**METHOD OF MEASUREMENT**

Subsection 614.13 shall include the following:

The Traffic Signal Vehicle Detector (Stop Bar Microwave) will be measured by the actual number of units installed and accepted, and will include warranty, testing, documentation, radar detection unit, cabinet interface device, power supply, power source termination, surge suppressor, installation hardware, all necessary wiring, communication cables, labor and all other items necessary to complete the work. Testing will be measured by verification of vehicle detection, speed, and Estimated Time of Arrival (ETA) of all lanes with 90 percent accuracy.

**BASIS OF PAYMENT**

Subsection 614.14 shall include the following:

<b>Pay Item</b>	<b>Pay Unit</b>
Traffic Signal Vehicle Detector (Stop Bar Microwave)	Each

**REVISION OF SECTION 620  
FIELD FACILITIES (SPECIAL)**

Section 620 of the Standard Specifications is hereby revised for this project as follows:

Delete Subsection 620.02 and replace it with the following:

620.2 Field Offices. Field offices shall conform to the details shown on the plans and to the requirements of this section. The field office for this project shall be a Field Office (Special) conforming to the following requirements:

- *CDOT Personnel*. Field Office (Special) shall accommodate 6 CDOT personnel
- *Field Office*. Mobile offices (2015 model or newer) or rented real property as approved by the CDOT Project Engineer. Field Office(Special) and Field Laboratory must be located in close proximity to the project area as approved by the CDOT Project Engineer. The minimum inside height for the field office shall be 7 feet.
- *Space Requirements*. Two (2) main offices for the CDOT Project Engineer and Assistant Project Engineer with a minimum of 100 SF (10'X10') of office space with solid walls, locking door, and minimum of one (1) locking window, additional office spaces shall provide a minimum of 80 SF (10'X8') of office space per person and can be enclosed offices with doors and windows, or divided cubicle space, one (1) conference room, large enough to accommodate the furniture and office items
- *Windows* (In Mobile Field Office). All windows shall have steel mesh installed for security. Minimum of four (4) windows (48'X36" min) shall be provided for the Field Office Facility.
- *Doors*. Two Entrance/Exit/ Egress doors shall be provided. A minimum of two (2) inside doors, one (1) for the main office partition and one (1) for the closet. The closet door shall be of solid wood with dead-bolt lock. Two outside doors shall be steel security with double cylinder (dual key) dead bolt locks. Reinforced decks and steps shall be installed at each outer door. An awning covering the deck shall be provided for each exterior door. All exterior doors shall have an exterior night light within four feet of the door, to brightly light the entrance/exit area. Street lighting or other nearby lighting will not be acceptable for doorway lighting.
- *Office Desks*. One desk per each CDOT personnel shall be supplied by the Contractor. The top of the desks shall be free of scratches, chips, or dents.
- *Trash Cans*. Each CDOT personnel shall have a medium size trash can.
- *Furniture / Office Items*. Shall be clean ,free of defects, mechanically sound and adhere to the requirements below.

The Conference Room shall have the following items:

- o One (1) large or multiple table(s) to accommodate up to 15 people;
- o Two (2) folding tables, 30" x 72" in dimension;
- o Fifteen (15) folding chairs;
- o One (1) dry erase board, 48" x 72" in dimension, with colored Dry erase markers;
- o One (1) cork bulletin board, 36" x 72" in dimension, with tacks;

The Main Office shall have the following items:

- o One (1) desk, 6 feet wide x 3 feet deep with six (6) drawers and center pencil drawer.
- o Two (2) "high back" padded chair with rollers
- o One (1) folding table, 24" x48";
- o One (1) cork bulletin board, 24" x 36" in dimension;
- o One (1) dry erase board, 48" x 72" in dimension;
- o Two (2) bookcases 4 feet high (min) x 4 feet wide x 12 inches deep with at least three (3) shelves;

Each Sub Office shall have the following items:

- o One (1) padded chair with rollers;
- o One (1) desk, 5 feet x 2'-6" with six (6) drawers and center pencil drawer.

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**REVISION OF SECTION 620  
FIELD FACILITIES (SPECIAL)**

- o One (1) bookcase, 4 feet high (min) x 4 feet wide x 16 inches deep with at least three (3) shelves;
- *Fire Extinguisher.* Two (2) 20-lbs. dry chemical extinguishers with current certifications;
- *Security Locks.* Ten (10) keys shall be provided for all locks (all outside door locks shall be keyed alike)
- *Heating & Air Conditioning.* The Field office, Lab, and Sanitary facility (indoor only) shall have HVAC systems to keep temperatures between 65 to 75 degrees Fahrenheit year round with thermostat control. The Contractor shall be responsible for maintenance and repairs of the HVAC system and must be fixed within four hours of being notified by the PM of a failure in the system. Filters shall be supplied and changed by the Contractor monthly.
- *Electrical.* A minimum of eighteen (18) 4 feet double 40 Watt tube fluorescent light fixtures located over desks and conference area and twenty-four (24) duplex outlets (two (2) per office min). One duplex outlet shall be located in the closet. One (1), new surge protection electrical power strips shall be provided for each CDOT Personnel by the contractor. Two (2), new auxiliary backup power supply surge protectors shall also be provided by the Contractor for the CDOT Project Manager.
- *Closet.* A closet totaling a minimum of thirty (30) SF with at least two shelves (1 foot minimum depth) fitted on each wall. The closet shall be equipped with a light and switch;

The Field Office (Special) shall be equipped with a Color Printer/Copier/Scanner machine that conforms to the following:

- *Printer/Copier/Scanner Machine.* The printer/copier/scanner machine shall be a newer, late model with a stationary platen, automatic sorter, and scanning to email capabilities. It shall have the following minimum capabilities:
  - o producing a minimum of 25 copies per minute;
  - o Copying and scanning an original document of size 8 ½" x 11" up to 11" x 17";
  - o An automatic document feeder capable of feeding a stack of up to 25 originals ranging in size from 8 ½" x 11" through 11" x 17";
  - o Reducing 11 x 17 plan sheets to 8 ½ x 14 legal size and to 8 ½ x 11 letter size;
  - o Two (2) standard paper cassettes accommodating paper sizes 8 ½" x 11" through 11" x 17". Each cassette shall accept a minimum of 250 sheets for a minimum total of 500 sheets of paper capacity;
    - Single-pass duplexing automatic document feeder;
    - Single sheet bypass for manual copying onto special stock not in paper cassettes and capable of using copy paper size of 8 ½" x 11" through 11" x 17";
  - o Automatic exposure control to automatically control the exposure level for each original with a manual light/dark exposure control and shall be capable of copying originals of both sheet and bound documents;
  - o Zoom magnification/reduction from 70% to 150% in 1% increments.
  - o 8 ½" x 11" through 11" x 17" printing/coping/scanning and scan-to-email capability
  - o Copy machine shall be equipped with a USB port which allows for scanning to a detachable media device (i.e. flash drive).
  - o Copy machine shall be capable of making 1 to 99 continuous copies and shall be capable of copying or printing onto Thin, Plain, Heavy, Recycled, Coated, Tracing, Bond, Transparency, Label, Pre-Punched and Envelope Paper.

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**REVISION OF SECTION 620**  
**FIELD FACILITIES**

- Copy machine shall provide finishing capabilities such as Collate, Group, Offset, Staple, Hole Punch, Eco Staple and Staple on Demand; Printer/Copier/Scanner machine must have both Ethernet and USB connectivity and be compatible with CDOT office computers to connect directly to the Copier/scanner via USB cable provided by the Contractor. This may require an extended USB cable.

The Field Office (Special) shall be equipped with Telephone service and Computer Networking Systems that conforms to the following:

- *Networking System.* The Contractor shall provide internet access for all CDOT personnel in the Field Office and Field Laboratory. Each office shall have a dedicated port for each computer. Internet services shall require a wired modem and router exclusive to CDOT Personnel, to deliver internet services to each computer. A secured Wi-Fi system shall be required for use by authorized CDOT staff only for smart-phones, tablets and any other devices used by the Department's staff.

The Contractor shall maintain all furnished equipment in good working condition and shall provide replacement equipment due to breakage, damage, or theft within five working days. The Contractor will provide paper, supplies, toner, parts, service and repairs for the Color Printer/Copier/Scanner machine as directed by the CDOT Project Manager. The Contractor shall be required to set up and test all of the functions of the printer/copier/scanner and scan-to-email abilities.

Field Office (Special) and Field Laboratory shall have all necessary phone and Ethernet ports to accommodate a modern office network system and access to the web via broadband internet services. Only current standard CAT5e and RG6 (or better) networking cables and wiring shall be allowed. The Contractor shall provide a sufficient length of communications cord for all CDOT computers and printer/copier/scanner machines. The Contractor shall also provide eight all Ethernet patch cables of sufficient length with RJ-45 end connections. The Contractor will be responsible for running these cables through the office such that each office will have a computer connection available.

The Contractor shall provide computer broadband services for the entire duration that the Field Office (Special) is in use by Department personnel. This broadband service shall have a connection speed of 200 Mbps or higher and shall be capable of supporting this connection speed on up to nine (9) computers simultaneously. Broadband service speed shall be periodically tested by CDOT staff to determine if sufficient connection speeds are maintained. Consistently tested speeds results below 120 Mbps will be recorded and may delay progress estimates until the speeds are corrected.

The Field office and lab shall be serviced by a minimum of two (2) Sanitary Facilities for exclusive use by CDOT personnel and guests of the department to the project only. One (1) sanitary facility shall be an ADA compliant portable facility. If the field office is to be located in an office space, two bathrooms (one ADA compliant) within the same office space must be available exclusively for CDOT staff and have working fans or a window.

The Field Office (Special), Field Laboratory, and Sanitary Facilities shall be cleaned and restocked weekly by the Contractor. Cleaning shall include the removal of all trash in receptacles, sweeping, dusting, vacuuming, mopping of floors, toilet and sink cleaning, and any other basic cleaning as required. Hand sanitizers, fresheners, paper towels, toilet paper, or any other standard toiletry or disposable items shall be refreshed weekly.

Failure of the Contractor to comply with these provisions shall be considered sufficient reason for the Engineer to order, in writing, a work stoppage in accordance with the Contract provisions.

**4**  
**REVISION OF SECTION 620**  
**FIELD FACILITIES**

Subsection 620.07 shall include the following:

620.07 Maintenance, Service, and Utilities. The Contractor shall furnish the following:

- *Security:* The Field Office (Special) and Field Laboratory shall each be equipped with a Security guard on premises at all times during non-working hours or a surveillance or silent watchman-type electronic security system installed in each of the field facilities and in the yard in which the facilities are set and as directed by the CDOT Project Manager.

The mobile Field Office and Field laboratory lab facility shall be provided with a security-fenced and lighted yard, one twenty foot double gate, adequate area to accommodate the Field Office (Special) and the Field Lab, Sanitary Facility, trash dumpster and parking for eight vehicles. Field facilities shall be provided with all-weather surfacing and all-weather access. Acceptable all-weather surfacing shall be concrete or asphalt surfaces or as approved by the Engineer.

The fenced area for facilities shall be for the exclusive use of the Engineer, unless otherwise approved.

- *Drinking Water:* Drinking water shall be dispensed from a device that provides both hot and cold water. The Contractor will be responsible for providing sufficient drinking water for the CDOT staff for the duration of the project.
- *Trash:* Office size trash cans shall be provided for each office. A large dumpster shall be provided outside of the field facilities for trash.
- *Insurance:* The Contractor shall provide insurance against theft or damage for all inventory stored in the field facilities (\$ 50,000 minimum). The Contractor shall maintain all furnished equipment and repair or replace any equipment damaged or stolen within five (5) working days.
- *Mobile Telephones:* The Contractor shall provide all CDOT Staff on the project with handheld portable cellular telephones. These telephones shall be capable of sending and receiving text and photos messages. The CDOT Project Engineer shall be supplied with the latest edition of a Samsung™, Android™ OS based smartphone or an approved equal on the Verizon™ wireless network or other major wireless provider in the Denver Area. All telephones shall be equipped with charging units and adapters for both AC and car charging as well as belt clips. All telephones shall each be provided with a private number, call forwarding, call conferencing, call waiting, unlimited texting and voice message capabilities. In addition, the Contractor shall provide the Contractor's Superintendent with one (1) handheld portable telephone and the Traffic Control Supervisor with one (1) handheld portable telephone. Contractor shall be responsible for all cellular service contracts and terms.

All Field Facilities shall be fully functional for the CDOT Project Engineer's use from the first day of work, until ninety (90) calendar days after project acceptance or until the CDOT Project Engineer requests removal in writing, whichever time is least.

Subsection 620.08 shall include the following:

**5**  
**REVISION OF SECTION 620**  
**FIELD FACILITIES**

All costs included with the items identified in this specification, as well as all incidental costs shall be included in the original contract prices for Field Office (Special), Field Laboratory (Class 2), and Sanitary Facility items.

Payment for Field Office (Special), Field laboratory (Class 2), and Sanitary Facility will be made after full acceptance of the facilities has been made in writing by the CDOT Project Engineer as follows:

All items shall be paid in equal increments beginning with the first progress estimate and ending with the final progress estimate once the field facilities are accepted by the Project Engineer.

Restoration of Field Facilities (Special) will be required unless otherwise directed. Restoration will not be paid for separately, but shall be included in the work.

Payment will be made under:

<b>Pay Item</b>	<b>Pay Unit</b>
Field Office (Special)	Each
Field Laboratory (Class 2)	Each
Sanitary Facility	Each



**REVISION OF SECTION 626  
PUBLIC INFORMATION MANAGEMENT  
(TIER III)**

Section 626 of the Standard Specifications for this project to include the following:

**DESCRIPTION**

This work consists of providing Public Information Management for the duration of the project. The Contractor shall submit all documentation associated with the Public Information Management item to the Project Engineer. Before approval, the Engineer will coordinate review and approval with the Region Communications Manager (RCM).

Anticipated communications issues on this project include:

- |                             |                   |                             |
|-----------------------------|-------------------|-----------------------------|
| (1) Sidewalk/Trail Closures | (2) Lane Closures | (3) Signal Work             |
| (4) Construction Phasing    | (5) Night Work    | (6) Raised Median Additions |

**CONSTRUCTION REQUIREMENTS**

(a) *Public Information Manager (PIM)*. The PIM shall perform all activities associated with Public Information Management for this project. In the event the PIM is not available, the Backup PIM shall perform the required activities. The PIM shall not be the Project Superintendent.

Within ten (10) days of the Notice to Proceed date or five days before the Pre-construction Conference, whichever is later, and at least fourteen (14) days before the start of PIM work the Contractor shall submit the name, contact information, and resume of the PIM and the Backup PIM to the Engineer. The PIM and Backup PIM shall have a minimum of five years of professional experience in public or media relations, marketing, or other related field and appropriate verbal and written communication skills. Experience in administrative or business office duties is not a related field.

(b) *Activities of the PIM*. The PIM duties are:

- (1) *Project Onboarding/Offboarding Request Form*. The PIM shall complete and update the Project Onboarding/Offboarding Request Form (<https://form.jotform.com/71167524405150>) every month or as requested by the Engineer. The form will assist the PIM and CDOT with tracking required activities and deliverables.
- (2) *On-Call*. The PIM shall be available or on-call each day there is work on the project and shall be available upon the Engineer's request outside of normal working hours. The PIM and the Contractor shall participate with CDOT on all meetings requested by the Engineer.
- (3) *Public Information Office*. The Contractor shall establish a public information office equipped with a telephone, a local telephone number with voicemail, which becomes the Project Hotline, a computer, and an email address. Acceptable locations for the project's public information office include the project office or off-site within the Contractor's office or the PIM's office. The Project Information signs shall include the Project Hotline telephone number. The PIM shall update the Project Hotline telephone message greeting weekly at a minimum and include the project's anticipated completion date and forthcoming activities for the update period. The PIM shall answer calls, listen to voicemail, and check email throughout each day that construction operations are in effect. The PIM, and when necessary, the Engineer, shall respond to all inquiries with a phone call, a voicemail message, or an

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email within one day. The PIM shall document the contact's name, contact phone number or email address, and the action taken. Within two days of receiving the message, the PIM shall enter message details and follow-up action into the electronic reporting system.

- (4) *Project Meetings.* The PIM shall participate in the weekly project meetings, discuss communication issues, and provide a status on the items in this specification.
- (5) *Lane Closure Reporting.*
  - (i) *Electronic Reporting System.* Before the Pre-construction Conference and at least 14 days before the project start, the PIM shall submit a request for access to the electronic reporting system through the Project Onboarding/Offboarding Request Form (b.1). At least once per week, the PIM shall enter project information into the electronic reporting system.
  - (ii) *Weekly Lane Closures.* The Superintendent or PIM shall notify the Engineer one week in advance of all planned "no work" periods and planned lane closures. The PIM shall enter the planned weekly lane closures and updates into the electronic reporting system for the upcoming work period, Sunday through Saturday, by Thursday at 12:00 P.M. The Engineer will approve the Lane Closure and Updates by Friday at 3:00 P.M. Each Monday by 12:00 P.M., the PIM shall review [www.cotrip.org](http://www.cotrip.org) and verify that the lane closure and update information is accurate. If corrections are necessary, the PIM shall coordinate with the Engineer to make necessary corrections to [www.cotrip.org](http://www.cotrip.org).
  - (iii) *Real-Time Lane Closure Changes.* The Superintendent shall notify the PIM and the Engineer at least 24 hours in advance on approved Lane Closure changes. The Engineer will notify the PIM when the electronic reporting system is available for changes. After completing the changes, the PIM shall notify the Engineer that the changes are ready for review and approval.
- (6) *Public Information Collateral.* The PIM shall develop a variety of Public Information Collateral to share project information for project milestones such as long-term closures or impactful construction activities. Collateral includes the following:
  - (i) *Photographs and Video Recordings.* The PIM shall take digital photographs and video recordings at regular intervals and submit them to the Engineer. The PIM may use a cell phone camera. Photographs and video recordings shall capture a variety of work activities and other areas of work as identified by the Contractor or the Engineer. Public Information Collateral shall include these photographs and video recordings. The PIM shall submit a minimum of two digital photographs or video recordings of the project activities and progress each month. Each photograph and video recording shall include the project number, project code, date, time, location and station or milepost, and name of the person taking the photograph or video recording.
  - (ii) *Maps and Graphics.* The PIM shall develop maps, detour maps, and graphics for use in Public Information Collateral.

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- (iii) *Web Page Updates.* The PIM shall work with CDOT to develop the latest project information for the internet web page content. The PIM shall supply information for the web page using the CDOT web page template in the Project Onboarding/Offboarding Request Form PIM resources. When applicable, the updates shall contain all appropriate web page links to and from other sites. The PIM shall provide updated information at least weekly. In addition, CDOT will update the web page.
- (iv) *Stakeholder List.* The PIM shall submit a Stakeholder List as a component of the Public Information Plan with each stakeholder's name, telephone number, email address, and notes on communication needs for the project.
  - (i) City of Golden  
Contact Name: John Hardy  
Email: jhardy@cityofgolden.net
  - (ii) Jefferson County  
Contact Name: Steve Durian  
Email: sdurian@co.jefferson.co.us
  - (iii) Golden Pond Retirement Community  
Contact Name: Michael Morris  
Email: michael.morris@goldenpond.com  
Contact Name: Troy McClymonds  
Email: Troy@stagesenior.com
  - (iv) Golden Lodge Assisted Living & Memory Care  
Contact Name: Kim Backes  
Email: kbackes@goldenlodgeassisted.com
- (v) *Public Information Management Contact Sheet.* The PIM shall prepare and update a Public Information Management Contact Sheet with the names and contact information of the individuals pertinent to the project's public information. At a minimum, the Contact Sheet shall include the Resident Engineer, Project Engineer, RCM, CDOT website administrator, and the electronic reporting system administrator, PIM, Backup PIM, Contractor Superintendent, and Traffic Control Supervisor. The contact sheet shall include the applicable Traffic Management Centers. (Joint Operations Center-Golden, Joint Operations Area-Eisenhower Johnson Memorial Tunnel, Joint Operations Center-Pueblo, and Joint Operations Center-Hanging Lake Tunnels.) The Public Information Plan shall include the Public Information Management Contact Sheet.

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- (vi) *Traffic Advisories and Project Updates.* The PIM shall develop weekly traffic advisories and project updates developed from the weekly Lane Closure Report, including lane closures and project update information. The CDOT traffic advisories and project updates templates are available in the Project Onboarding/Offboarding Request Form PIM resources. The Engineer will approve traffic advisories and project updates before distribution. The PIM shall email the traffic advisory and project updates to the stakeholder list by Friday of each week to announce the following week's upcoming project activity. The emailed advisory may come from the project email box or an automated distribution platform. A Mailchimp account is available through CDOT.
- (vii) *Media Relations.* At least 14 days before the start of work or a milestone, the PIM shall prepare media releases using the CDOT media release template available in the Project Onboarding/Offboarding Request Form PIM resources. The PIM shall allow the Engineer at least three-days to review and approve the media release before distribution. CDOT will distribute media releases. CDOT will address all media inquiries and media requests. The PIM shall immediately notify the Engineer of any project and on-site situations involving the media. When the media contacts the PIM or Contractor staff, the PIM shall provide the media the RCM's contact information.

The PIM shall prepare a media release announcing the project, summarizing the project scope, construction phasing, construction activities that affect traffic, the project end date, and a summary of project benefits. The PIM shall develop additional media releases for major construction milestones, traffic control or lane shifts, closures, project completion and as directed by CDOT. The releases shall also include maps or other graphics.

- (viii) *Project Fliers.* The PIM shall develop project fliers using the CDOT project flier template available in the Project Onboarding/Offboarding Request Form PIM resources. The PIM shall submit the draft project flier to the Engineer for review 10 days before the planned distribution and shall distribute the project flier at least 10 days before the Project's start or milestone. The review and approval of the project flier will not exceed five days.

This project requires project fliers at the following milestones:

1. Initial project flier

The initial project flier shall provide the project start and end dates, project location, description of work, traffic impacts, scheduled work hours and workdays, the Project Hotline telephone number, email address, web address, project map, photo of the project area, and a construction safety message as defined by CDOT. The PIM shall distribute the initial project flier before construction starts.

Develop the list of recipients via <http://uspseverydoordirectmail.com>, from county GIS mapping, or other approved method. The PIM shall deliver one approved flier per property owner and each tenant within 1 mile of the project limits. The estimated number of printed fliers is 8,500. The PIM shall distribute an email containing a digital form of the flier to stakeholders identified in the Stakeholder List.

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- (7) *Public Information Plan.* The PIM shall submit a Public Information Plan (PIP) within five days of the Pre-construction Conference. The PIP shall be specific to the project. The PIP shall include public information strategies for affected road users using the Public Information Collateral, the expected work zone impacts and closure details, commuter alternatives, community, government and business relations, media relations, identification of public information issues, proposed outreach strategies, approach to crisis communications, the Stakeholder List, and the Public Information Management Contact Sheet. The PIM shall update the plan when necessary and as directed by the Engineer. The PIP is a component of subsection 630.10 Transportation Management Plan.
  - (8) *Limited English Proficient (LEP) Individuals.* A LEP is an individual for whom English is not their primary language and who has a limited ability to read, write, speak, or understand English. The PIM shall provide language assistance of the Public Information Collateral when the project is located in a community that has greater than five percent LEP individuals. Project-related language assistance includes translation, interpretation services, or communication in a form the LEP person understands. The PIM shall document all measures taken to communicate with LEP persons, record all requests for language assistance, and submit the documentation to the Engineer.
- (c) *Response Protocol to CDOT and the Public.* The PIM shall follow Table 626-1 in responding to correspondence from stakeholders and the public:

**Table 626-1 - Response Timing**

<b>Type</b>	<b>Timing</b>
Project Hotline calls and voice messages	Answer calls and check messages throughout each day. Respond within one day. Enter details into the electronic reporting system within two days.
Email messages	Respond within one day. For high volume situations, respond within two days. Enter details into the electronic reporting system within two days.
Calls from CDOT Staff	Respond as soon as possible, and within 24 hours.
Web page inquiries	Respond within one day. For high volume situations, respond within two days.

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**REVISION OF SECTION 626  
PUBLIC INFORMATION MANAGEMENT  
(TIER III)**

**METHOD OF MEASUREMENT**

Public Information Management will be measured as the number of days elapsed from \*14 days before the construction start date and no earlier than the project Notice to Proceed through \* Final Acceptance. Failure to provide acceptable Public Information Management will result in withholding of payment for the days affected as determined by the Engineer.

**BASIS OF PAYMENT**

Pay under:

<b>Pay Item</b>	<b>Pay Unit</b>
Public Information Management (Tier III)	Day

Payment for Public Information Management will be full compensation for each measured day where the work, materials, and equipment to provide public information as per this specification.

If the Contractor fails to complete construction within the approved contract time, CDOT will not pay for Public Information Management for the period after expiration of the approved contract time. The Contractor shall continue to provide Public Information Management through Final Acceptance at its expense.

**REVISION OF SECTION 627 and 713  
PREFORMED THERMOPLASTIC PAVEMENT MARKING**

Section 627 of the Standard Specifications is hereby revised for this project as follows:

**CONSTRUCTION REQUIREMENTS**

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 retroreflectivity are maximized.

Section 627 of the Standard Specifications is hereby revised for this project to include the following:  
Subsection 627.09 (c) is hereby added to the Standard Specifications for this project as follows:

(c) *Inlaid (Word-Symbol) (X-walk/Stop-bar) (Shield)*

All Preformed Thermoplastic 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 milli-inches (mils) +/- 10 mils. The inlaid area for the new Preformed Thermoplastic Pavement Marking shall be in the same shape or pattern as the Preformed Thermoplastic Pavement Marking that is being installed. Grinding of existing preformed thermoplastic pavement marking and existing asphalt shall not be measured and paid for separately, but shall be included in the work.

Colorado epoxy glass beads and anti-skid elements applied to the surface of the material to ensure the required skid resistance and retroreflectivity will not be measured and paid for separately, but shall be included in the work.

Surface shall be dry and free of dirt, dust, chemicals, and significant oily substances. 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 ensure proper adhesion.

The Contractor shall require the stencil manufacturer 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 manufacturer. 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 Colorado Department of Transportation (CDOT) project engineers and inspectors. Training shall be incidental to the work.

1. The Contractor shall use a durable, high skid resistant, retroreflective pavement marking material suitable for use as interstate shields; route shields; and bike path, roadway, intersection, airport, commercial, or private pavement delineation and markings.
  - A. The markings shall be a resilient white, yellow, or other color thermoplastic product, the surface of which shall contain glass beads and abrasives in an alternating pattern. The markings shall be resistant to the detrimental effects of motor fuels, lubricants, hydraulic fluids, etc. Lines, legends, and symbols shall be capable of being affixed to bituminous or Portland cement concrete pavements by the use of the normal heat of a propane torch.

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**REVISION OF SECTION 627 and 713  
 PREFORMED THERMOPLASTIC PAVEMENT MARKING**

- B. The markings shall be capable of conforming to pavement contours, breaks, and faults through the action of traffic at normal pavement temperatures. The markings shall have resealing characteristics, such that it is capable of fusing with itself and previously applied thermoplastic when heated with the torch.
  - C. The markings shall not have minimum ambient and road temperature requirements for application, without any preheating of the pavement or special storage, handling, preheating, or treatment of the material before application.
2. Manufacturing Location, Control and International Standards Organization (ISO) Certification: The marking material must be produced in the United States, and the manufacturer must be ISO 9001:2015 certified for design, development, and manufacturing of preformed thermoplastic pavement markings, and provide proof of current certification.
  3. Material: The marking material shall be composed of an ester modified rosin resistant to degradation by motor fuels, lubricants, etc. in conjunction with aggregates, pigments, binders, abrasives, and glass beads which have been factory produced as a finished product. The marking material shall meet the requirements of the current edition of the Manual on Uniform Traffic Control Devices for Streets and Highways. The thermoplastic material shall conform to American Association of State Highway and Transportation Officials (AASHTO) designation M249, with the exception of the relevant differences due to the material being supplied in a preformed state.

A. *Graded Glass Beads*

- (1) The material shall contain a minimum of 30 percent intermixed graded glass beads by weight. The intermixed beads shall conform to AASHTO designation M247, with minimum 80 percent true spheres and minimum refractive index of 1.50.
- (2) The material shall have factory applied coated surface beads and abrasives at a rate of 1/2 pound (0.23 kilogram) [± 20 percent] per 11 square feet (1 square meter) each in addition to the intermixed beads. The surface beads and abrasives shall be applied evenly across the surface of the material so that the surface is covered completely with glass beads and abrasive materials. The abrasive material shall have a minimum hardness of 9 (Mohs scale). The factory applied coated surface beads shall have a minimum of 80 percent true spheres, have a minimum refractive index of 1.50, and meet the following gradation:

Size Gradation				
US Mesh	Um	Retained, %		Passing, %
12	1700	0	-2%	98 – 100%
14	1400	0	-6%	94 – 100%
16	1180	1 – 21%		79 – 99%
18	1000	28	-62%	38 – 72%
20	850	62	-71%	29 – 38%
30	600	67	-77%	23 – 33%
50	300	86	-95%	5 – 14%
80	200	97-100%		0 – 3%



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**REVISION OF SECTION 627 and 713**  
**PREFORMED THERMOPLASTIC PAVEMENT MARKING**

- B. *Pigments.*
- (1) White: The material shall be manufactured with sufficient titanium dioxide pigment to meet Federal Highway Administration (FHWA) Docket\_No. FHWA-99-6190 Table 5 and Table 6 as revised and corrected.
  - (2) Red, Blue, and Yellow: The 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 yellow pigments shall be organic and shall be heavy-metal-free.
  - (3) Other Colors: The pigments shall be heavy-metal-free.
- C. Heating indicators: The top surface of the material (same side as the factory applied surface beads/abrasives) shall have regularly spaced indents. The closing of these indents during application shall act as a visual cue that the material has reached a molten state allowing for satisfactory adhesion and proper bead embedment, and as a post-application visual cue that the application procedures have been followed.
- D. Skid Resistance: The surface of the preformed thermoplastic (anti-skid material) items shall contain factory applied anti-skid material with a minimum hardness of 9 (Mohs scale). Upon application the material shall provide a minimum skid resistance value of 60 British Pendulum Number (BPN) when tested according to American Society for Testing and Materials (ASTM) E303. The surface beads and abrasives shall be applied evenly across the surface of the material so that the surface is covered completely with glass beads and abrasive materials.
- E. Thickness: The material shall be supplied at a minimum thickness of 125 mils (3.15 millimeters (mm)).
- F. Retroreflectivity: The material, when applied in accordance with manufacturer's guidelines, shall demonstrate a uniform level of sufficient nighttime retroreflection when tested in accordance to ASTM E1710. The applied material shall have an initial minimum intensity reading of 275 millicandelas per square meter per lux ( $\text{mcd}\cdot\text{m}^{-2}\cdot\text{lx}^{-1}$ ) for white, as measured with a pavement marking retroreflectometer.
- G. Environmental Resistance: The material shall be resistant to deterioration due to exposure to sunlight, water, salt, or adverse weather conditions and impervious to oil and gasoline.

Only Preformed Thermoplastic Pavement Marking material listed on the Department's approved products list may be used.

**BASIS OF PAYMENT**

Subsection 627.13 shall include the following:

<b>Pay item</b>	<b>Pay unit</b>
Preformed Thermoplastic Pavement Marking (Word-Symbol)	SF
Preformed Thermoplastic Pavement Marking (Xwalk-Stop Line)	SF

**REVISION OF SECTION 630  
UNIFORMED TRAFFIC CONTROL  
(LOCAL AGENCY)**

Section 630 of the Standard Specifications is hereby revised for this project to include the following:

**DESCRIPTION**

This work consists of furnishing a uniformed police agency officer from the following local agency to perform uniformed traffic control:

- Cody Schroeder  
303-909-4608  
[cschroeder@cityofgolden.net](mailto:cschroeder@cityofgolden.net)  
Golden Police Department  
9911 10th St, Golden, CO 80401
- Jefferson County Sheriff's Office 303-271-0211  
200 Jefferson County Pkwy, Golden, CO 80401

**MATERIALS**

- (a) *Qualifications.* The local agency officer shall have completed "The Safe and Effective Use of Law Enforcement Personnel in Work Zones" Training Course. The Contractor shall provide copies of documentation certifying the officer's successful completion of this course.

The light bars shall be mounted on traffic control vehicles, and shall be maintained in good operating condition at all times. The Contractor shall obtain a permit from the police or sheriff department, as appropriate, for the use of the light bars. The Contractor 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

**METHOD OF MEASUREMENT**

Uniformed Traffic Control will be measured by the total number of hours that are required for uniformed traffic control including minimum shift hours required by the agency.

**BASIS OF PAYMENT**

Uniformed Traffic Control (Vehicle) will be measured as the contract unit price per hour for the uniformed traffic control officer and traffic control vehicle.

Payment will be made under:

<b>Pay Item</b>	<b>Pay Unit</b>
Uniformed Traffic Control (Vehicle)	Hour

Hours of Uniformed Traffic Control or Uniformed Traffic Control (Vehicle) that are not authorized or approved will not be paid for. Scheduling of traffic control will not be measured and paid for separately, but shall be included in the work.

**REVISION OF SECTION 630  
PORTABLE MESSAGE SIGN PANEL**

Section 630 of the Standard Specifications is hereby revised for this project as follows:

Subsection 630.01 shall include the following:

This work includes furnishing, operating, and maintaining a portable message sign panel.

Add subsection 630.031 immediately following subsection 630.03 as follows:

**630.031 Portable Message Sign Panel.** Portable Message Sign Panel shall be furnished as a device fully self-contained on a portable trailer, capable of being licensed for normal highway travel, and shall include leveling and stabilization jacks. The panel shall display a minimum of three - eight character lines. The panel shall be a dot-matrix type with an LED legend on a flat black background. LED signs shall have a pre-default message that activates before a power failure. The sign shall be solar powered with independent back-up battery power. The sign shall be capable of 360 degrees rotation and shall be able to be elevated to a height of at least five feet above the ground measured at the bottom of the sign. The sign shall be visible from one-half mile under both day and night conditions. The message shall be legible from a minimum of 750 feet. The sign shall automatically adjust its light source to meet the legibility requirements during the hours of darkness. The sign enclosure shall be weather tight and provide a clear polycarbonate front cover.

Solar powered message signs shall be capable of operating continuously for 10 days without any sun. All instrumentation and controls shall be contained in a lockable enclosure. The sign shall be capable of changing and displaying sign messages and other sign features such as flash rates, moving arrows, etc.

Each sign shall also conform to the following:

- (1) In addition to the onboard solar power operation with battery back-up, each sign shall be capable of operating on a hard wire, 100-110 VAC, external power source.
- (2) All electrical wiring, including connectors and switch controls necessary to enable all required sign functions shall be provided with each sign.
- (3) Each sign shall be furnished with an operating and parts manual, wiring diagrams, and trouble-shooting guide.
- (4) The portable message sign shall be capable of maintaining all required operations under Colorado mountain-winter weather conditions.
- (5) Each sign shall be furnished with an attached license plate and mounting bracket.
- (6) Each sign shall be wired with a 7-prong male electric plug for the brake light wiring system.

Subsection 630.13 shall include the following:

The portable message sign panel shall be on the project site at least 7 days prior to the start of active roadway construction. Maintenance, storage, operation, relocation to different sites during the project, and all repairs of portable message sign panels shall be the responsibility of the Contractor.

Subsection 630.18 shall include the following:

Portable message sign panels will be measured one of the two following ways:

- (1) By the actual number of days each portable message sign is used on the project as approved by the Engineer.
- (2) By the maximum number of approved units in use on the project at any one time.

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**REVISION OF SECTION 630**  
**PORTABLE MESSAGE SIGN PANEL**

Subsection 630.19 shall include the following:

<b>Pay Item</b>	<b>Pay Unit</b>
Portable Message Sign Panel	EACH

**REVISION OF SECTION 630  
MOBILE ATTENUATOR**

Section 630 of the Standard Specifications is hereby revised for this project as follows:

Subsection 630.01 shall include the following:

This work shall consist of furnishing, operating, and maintaining a truck with an attached impact attenuator.

Subsection 630.09 shall include the following:

**Mobile Attenuator Options:**

**Truck Mounted Attenuator.** The Contractor shall supply a vehicle with a truck mounted attenuator approved by the FHWA to meet NCHRP 350 criteria for level TL-3 collisions. The attenuator shall be mounted to a suitable truck in a manner meeting the Manufacturer's specifications. The truck shall be furnished with a roof-mounted Advance Warning Flashing or Sequencing Arrow Panel (B Type). The truck shall be used when setting up or taking down the work zone and shall be parked in the activity area protecting the construction work while work is being performed, unless otherwise directed.

**Trailer Attenuator.** The Contractor shall supply a vehicle with an attached trailer attenuator approved by the FHWA to meet NCHRP 350 criteria for level TL-3 collisions. The trailer attenuator shall be attached to a suitable host truck in a manner meeting the Manufacturer's specifications, to include factory-installed 20-ton (minimum) rated pintle hook and ½-inch (minimum) steel frame plate, or as specified by the Manufacturer. The trailer shall be furnished with a mounted Advance Warning Flashing or Sequencing Arrow Panel (B Type).

The weight of the host truck shall be between 10,000 and 20,000 lbs, or as specified by the trailer attenuator manufacturer. The Contractor shall provide a certified scale ticket confirming the weight of the truck without a trailer attached.

The Trailer Attenuator attached to its host truck shall be used when setting up or taking down the work zone and shall be parked in the activity area protecting the construction work while work is being performed, unless otherwise directed. A buffer zone shall be provided in front of the host truck, for worker safety. This buffer zone shall be in accordance with the manufacturer's recommendations, but shall be no less than 100 feet in length, unless otherwise directed.

Subsection 630.13 shall include the following:

Maintenance, storage, operation, and all repairs of Mobile Attenuator and associated vehicles shall be the responsibility of the Contractor.

Subsection 630.17 shall include the following:

Mobile Attenuators will be measured as the actual number of attenuators that are used during construction; or the actual number of authorized 24-hour periods that the attenuator is used.

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**REVISION OF SECTION 630**  
**MOBILE ATTENUATOR**

Subsection 630.18 shall include the following:

<b>Pay Item</b>	<b>Pay Unit</b>
Mobile Attenuator	Day

Payment will be full compensation for all labor, materials and equipment required to operate and maintain the truck and attenuator for the duration of the project, including the attenuator and flashing panel.

**REVISION OF SECTION 630  
LANE DIVIDER (TEMPORARY)**

Section 630 of the Standard Specification is hereby revised for this project as follows:

**DESCRIPTION**

This work consists of furnishing, installing, maintaining, and removing lane dividing tubular markers at the locations called for in the plans.

**MATERIALS AND EQUIPMENT**

The height of the tubular marker above the pavement surface shall be a minimum of 36 inches. Tubular marker color must be uniform and integral throughout the entire height of the post and stabilized to resist UV degradation. Tubular markers shall be orange in color with white and crystal retroreflective sheeting to improve visibility in low light conditions. The base may be black in color or the same color as the post.

The posts shall be secured to the base units with rust-proof black plastic locking pins conforming to the same material specifications as the base units to prevent dislocation when posts are impacted and to ease replacement of old posts.

**CONSTRUCTION REQUIREMENTS**

Tubular markers are to be affixed to the pavement surface as a supplement to pavement markings to channelize traffic and divide lanes during temporary traffic control work.

The tubular markers should be secured to the pavement surface with removable and reusable anchor bolts. All bolts shall be removable with standard power tools. The channelizer posts and bolts shall be fully crash tested and shall meet NCHRP 350 Requirements.

The Contractor shall inspect and replace any worn out or missing tubular markers.

**METHOD OF MEASUREMENT**

The quantity to be paid will be the number of tubular markers furnished, installed, and accepted.

**BASIS OF PAYMENT**

The accepted quantities will be paid for at the contract unit price listed below that appears in the bid schedule.

<b>Pay Item</b>	<b>Pay Unit</b>
Lane Divider (Temporary)	Each

Payment includes all labor, equipment, and materials necessary to complete the work.

## **REVISION OF SECTION 632 NIGHT WORK LIGHTING**

Section 632 is hereby added to the Standard Specifications for this project as follows:

### **DESCRIPTION**

**632.01** This work consists of furnishing, installing, operating, maintaining, moving, adjusting, and removing lighting to illuminate construction work spaces for night work. Night work will be defined as work performed between 30 minutes before sunset and 30 minutes after sunrise.

### **MATERIALS AND EQUIPMENT**

**632.02** The Contractor shall provide lighting for night work in the activity area work space where construction equipment, workers on foot, or both are present. The work space is that portion of the roadway closed to road users, or outside of the roadway, set aside for workers, equipment and materials performing contract work. The work space may be stationary or may move as the work progresses.

Illumination may be accomplished by using a combination of portable lights, floodlights, equipment mounted lights, or other lighting methods that will provide the required minimum lighting intensity. Light fixtures that are mounted on the construction equipment shall have a secure connection to minimize vibration and ensure that the view of the equipment operator is not obstructed. Portable lights shall be aimed either generally parallel or perpendicular to the roadway, aimed downward towards the work to avoid glare to oncoming drivers. Existing street and highway lighting shall not eliminate the need for the Contractor to provide work area lighting. Vehicle headlights shall not be permitted as the sole means of illumination while working.

**632.03 Portable Generator and Inverter Generator.** The Contractor shall provide a portable generator, inverter generator, or both as needed to power the added equipment mounted lights on motorized equipment if the existing power supply on the equipment is insufficient to power the added lights. Fuel tank capacity and availability of fuel on site shall be sufficient to permit uninterrupted operation throughout the planned shift. All power sources shall be equipped with a ground-fault circuit interrupter. The generator shall be placed or temporarily mounted on the equipment without obstructing access onto the equipment or the view of the operator.

**632.04 Light Meter.** The Contractor shall furnish a light meter for use by the Engineer. The meter shall have a digital display calibrated to NIST standards, shall be cosine and color corrected with an accuracy of +/- 5 percent. The light meter shall remain the property of the Contractor after final acceptance.

### **CONSTRUCTION REQUIREMENTS**

**632.05** Lighting for night work shall include:

- (1) Minimum lighting intensity of 5 foot candles for work space illumination.
- (2) Illuminate the stationary work space as stated in (1) above where construction equipment, workers on foot or both are present.
- (3) Light sources shall be positioned not to interfere with or impede traffic in any direction and not cause glare for motorists or onto adjacent properties whenever possible. The Contractor shall make adjustments, use visors or shields, or both to minimize glare.



**REVISION OF SECTION 632  
NIGHT WORK LIGHTING**

- (4) Illumination for mobile operations within a closed travel lane with traffic control devices will be defined as 20 feet in front of and behind and 5 feet to each side of each piece of moving equipment.
- (5) The Contractor shall provide portable lights for the Engineer's and Contractor's personnel performing materials testing for either mobile or stationary operations to illuminate the testing work space as stated in (1) above. For concrete operations at night, the Contractor shall illuminate the designated concrete truck washout location including the access and the wash-out site.
- (6) Workers on foot, performing work within a moving work space (i.e. striping layout/installation, surveying, etc.) shall wear ANSI approved high visibility apparel and headwear for Class 3 risk exposure including vest, Class E pants or leg gaiters, and reflective tape on hard hats. Workers may use portable lighting that can be worn on the hard hats that provide 360 degree visibility.
- (7) Portable light towers and lights mounted on stands shall be sturdy and free-standing without the aid of guy wires or bracing. Minimum illumination levels as stated in (1) above shall be maintained at a distance of 5 feet on all sides of stationary equipment with either equipment mounted or free standing lights.
- (8) The Contractor shall ensure that all pieces of equipment have operating lights to illuminate operator's controls, backhoe and loader buckets, and illuminate the equipment reach limits around rotating equipment (i.e. the paving machine shall have illumination for the hopper, auger, and screed areas).
- (9) The TCS vehicle shall have the rear of the truck illuminated while installing, maintaining, and removing traffic control devices unless sufficient lighting levels exist with stationary lights.
- (10) The Contractor shall maintain a uniformity ratio no greater than 5:1 over the stationary work space. Uniformity ratio is the ratio of average to minimum horizontal illuminance within the work space. The uniformity ratio shall be determined by dividing the average of all light meter measurements by the light meter measurement at the darkest spot within the illuminated area.

**632.06 Night Work Lighting Plan.** The Contractor shall submit a lighting plan to the Engineer for review signed by the Contractor's designated person three days in advance of the Preconstruction Conference. The lighting plan shall appropriately describe the work and include the following:

- (1) Layout drawing and supplemental narrative showing light locations, equipment mounted lights, and configuration including both typical spacing and lateral placement for each work activity.
- (2) Tabulation of lights for those lights that are included within the Night Work Lighting pay item. Lights included in the tabulation such as tower lights, lights mounted on stands and lighting mounted to mobile equipment (not original equipment lights) but those additional equipment mounted lights or portable lights that provide the 20 feet in front and behind illumination zone shall have catalog cuts giving the specific brand names, model numbers, lamp type and wattage.
- (3) Narrative description of those operations where workers will be on foot in a moving work space.
- (4) Details of hoods, visors, louvers, shields or other means to be used to minimize glare.

### **REVISION OF SECTION 632 NIGHT WORK LIGHTING**

The plan shall be revised and updated by the Contractor as requested by the Engineer during the progress of the work to accommodate changes to the work.

**632.07 Inspection of Lighting.** Lighting inspection by the Engineer will be performed jointly with the Contractor's designated person on a drive through the project to include (1) observation of the lighting setup to evaluate glare potential for drivers and workers and (2) light meter measurements to determine minimum illumination levels. The Contractor shall make adjustments to the lighting as needed based on the Engineer's inspection. In the event of any failure of the lighting system, the Engineer may decide to discontinue work until the required level of illumination is restored. Delays due to insufficient lighting levels are the responsibility of the Contractor. Any corrections and deficiencies needed to provide the minimum illumination levels shall be addressed by the start of the next work shift.

The Engineer will take light meter measurements to verify the minimum lighting levels using a light meter provided by the Contractor during the night work shift. Light meter readings will be taken within the work space where work is being performed, in a horizontal plane, with the light sensor part of the meter held parallel to the ground with the sensor aimed upward, 3 feet above the pavement or ground surface. Meter readings will be taken at the source at 5 foot intervals out to the illuminated work space perimeter. These measurements will be documented and filed in the project records.

**632.08 Lighting for Flagger Stations.** For nighttime flagging, flagger stations shall be illuminated by an overhead light source providing a minimum lighting intensity level of 5 foot candles measured 1 foot out from the flagger's chest. The flagger station light shall illuminate the station area with a radius of at least the width of the lane plus 5 feet, and be centered on the flagger in the initial flagging position. The size of the illuminated area shall be increased to account for flagger movements required to control traffic. The flagger station lighting shall be maintained at an adequate height above the pavement and be capable of being shielded through the use of visors, hoods, louvers, or screens as needed to minimize glare to approaching traffic and spilling over onto adjacent properties.

#### **METHOD OF MEASUREMENT**

**632.09** Lighting for night work will not be measured but will be paid for as a single lump sum.

#### **BASIS OF PAYMENT**

**632.10** Payment for lighting as shown on the Night Work Lighting Plan will include all labor, materials, and equipment necessary to complete and maintain the work. Payment for lighting will include portable 360° visibility lighting worn on hard hats.

Progress payments will be made based on the lump sum price bid as follows: 20 percent when the Lighting for Night Work Plan has been submitted, accepted, and satisfactory lighting of nighttime operations has begun; the remaining 80 percent will be paid in equal monthly progress payments for the remaining time lighting is required for the night work operations.

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**REVISION OF SECTION 632**  
**NIGHT WORK LIGHTING**

Payment will be made under:

<b>Pay Item</b>	<b>Pay Unit</b>
Night Work Lighting	Lump Sum

Flagger station lighting, designated person, light meters, and additional power sources (generator and inverter) will not be measured and paid for separately but shall be included in the work.

**FORCE ACCOUNT ITEMS**

**DESCRIPTION**

This special provision contains the Department's estimate for force account items included in the Contract. The estimated amounts marked with an asterisk will be added to the total bid to determine the amount of the performance and payment bonds. Force Account work shall be performed as directed by the Engineer.

**BASIS OF PAYMENT**

Payment will be made in accordance with subsection 109.04. Payment will constitute full compensation for all work necessary to complete the item.

Force account work valued at \$5,000 or less, that must be performed by a licensed journeyman in order to comply with federal, state, or local codes, may be paid for after receipt of an itemized statement endorsed by the Contractor.

<b>FORCE ACCOUNT ITEM</b>	<b>QUANTITY</b>	<b>ESTIMATED AMOUNT</b>
F/A Minor Contract Revisions	F/A	\$ 360,000*
F/A Asphalt Cement Cost Adjustment	F/A	\$ 44,000
F/A Fuel Cost Adjustment	F/A	\$ 30,000
F/A On-the-Job Trainee	F/A	\$ 16,000
F/A Project First Program	F/A	\$ 2,000
F/A Asphalt Pavement Incentive	F/A	\$ 126,000
F/A Roadway Smoothness Incentive	F/A	\$ 180,000
F/A Erosion Control	F/A	\$ 5,000*
F/A Interim Surface Repair	F/A	\$ 40,000
F/A Landscaping	F/A	\$ 5,000*
F/A Furnish and Install Electrical Service	F/A	\$ 2,000

**F/A Asphalt Pavement Incentive.**

Incentive for HMA (PG 76-28 mix) shall be made in accordance with Revision of Sections 105 and 106 – Conformity to the Contract of Hot Mix Asphalt (Voids Acceptance). Incentive for HMA (PG 64-22 mix) shall be made in accordance with Subsection 105.05 of the 2022 Standard Specifications and Revision of Section 106 – Conformity to the Contract of Hot Mix Asphalt (Less than 5,000 Tons).

**F/A Roadway Smoothness Incentive.**

Roadway Smoothness Incentive will be made in accordance with Subsection 105.07 - Conformity to Roadway Smoothness Criteria.

**F/A Asphalt Cement Cost Adjustment.**

Asphalt Cement Cost Adjustment will be made in accordance with Revision of Section 109 - Asphalt Cement Cost Adjustment (Asphalt Cement Included in the Work).

**F/A Interim HMA Surface Repair.**

This work consists of placing and compacting a machine scratch course in locations as directed by the Engineer. The machine scratch course may be used once the Contractor meets all the specification requirements for the Revision of Section 202 - Removal of Asphalt Mat (Planing) and irregularities such as, but not limited to, delamination and raveling exceeding 10 percent within any ½ mile segment that are encountered prior to the specified time of the overlay.

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**FORCE ACCOUNT ITEMS**

**F/A Minor Contract Revisions.**

Consists of minor work authorized and approved by the Engineer, which is not included in the contract plans or specifications, and is necessary to accomplish the scope of work of this contract.

**F/A Fuel Cost Adjustment.**

Adjustment will be made in accordance with subsection 109.06(i).

**F/A On-the-Job Trainee.**

Cost of maintaining an on-the-job pilot training program in accordance with the Standard Special Provision.

**F/A Project First Program.**

Cost of participating in a Project First Program between the Contractor and the Department in accordance with the Standard Special Provision.

**F/A Erosion Control.**

Supplemental erosion control measures suggested by the Erosion Control Supervisor, but not provided for in the contract plans or specifications. All items shall be approved by the Engineer prior to installation or they will be at no cost to the project.

**F/A Landscaping.**

Cost for landscape establishment work and maintenance in accordance with the Standard Special Provision.

**F/A Furnish and Install Electrical Service.**

The contractor shall be responsible for the coordination of work to be performed by the power service provider. The Contractor shall contact Xcel Energy - builders call line at 1-800-628-2121 to request, and process to completion, the required coordination to establish the power source. The contractor shall perform all work necessary to maintain existing or establish a new power source to the devices called for in the plans and per the standard for any metered sources. The power service provider will furnish and install the electric meter.

All cost charges from the power service provider, and all necessary materials, labor, and coordination required to maintain existing or establish new power sources required for permanent operation of equipment as shown in the plans shall be reimbursed from the F/A "furnish & install electrical service" item

### TRAFFIC CONTROL PLAN - GENERAL

The key elements of the Contractor's method of handling traffic (MHT) are outlined in subsection 630.10(a).

The components of the TCP for this project are included in the following:

- (1) Subsection 104.04 and Section 630 of the specifications.
- (2) Standard Plan S-630-1, Traffic Controls for Highway Construction, Case 3, 17, 19, 20, 24, 34, 35 and Standard Plan S-630-2.
- (3) Schedule of Construction Traffic Control Devices.
- (4) Signing Plans.
- (5) Construction phasing details.

*Allowable Lane Closures.* The Contractor will be allowed lane closures per the hours listed in Table 1 below, or as directed by the Engineer. No work will be allowed on weekends, unless approved by the Engineer at least two (2) weeks prior to the weekend closure.

LOCATION	SINGLE-LANE CLOSURE
MP 0.00 to MP 0.419 (SH 58 to I-70)	6PM TO 6AM & 9AM to 3PM
MP 0.419 to MP 3.035 (I-70 to 58th Ave)	8PM to 6AM

(Table 1)

Unless otherwise approved by the Engineer, the Contractor's equipment shall follow normal and legal traffic movements. The Contractor's ingress and egress of the work area shall be accomplished with as little disruption to traffic as possible. Traffic control devices shall be removed by picking up the devices in a reverse sequence to that used for installation. This may require moving backwards through the work zone. When located behind a barrier or at other locations shown on approved traffic control plans, equipment may operate in a direction opposite to adjacent traffic.

CDOT may have entered into operating agreements with one or more law enforcement organizations for cooperative activities. Under such agreements, at the sole discretion of CDOT, law enforcement personnel may enter the work zone for enforcement purposes and may participate in the Contractor's traffic control activities.

The responsibility under the Contract for all traffic control resides with the Contractor and any such participation by law enforcement personnel in Contractor traffic control activities will be referenced in either the Special Provisions or General Notes of the plans depending on whether the Contractor is to hire local law enforcement or if CDOT is contracting with Colorado State Patrol for uniformed traffic control. Nothing in this Contract is intended to create an entitlement, on the part of the Contractor, to the services or participation of the law enforcement organization.

**TRAFFIC CONTROL PLAN - GENERAL**

Special Traffic Control Plan requirements for this project are as follows:

During the construction of this project, traffic shall use the present traveled roadway unless identified on the plans or approved by the Engineer.

The Contractor shall not have construction equipment or materials in the lanes open to traffic at any time, unless approved by the Engineer.

During the resurfacing work, only one lane may be closed to traffic at any time unless approved by the Engineer. Traffic shall not be delayed for more than 15 minutes or as directed by the Engineer.

At least one week prior to starting construction, the Contractor shall notify the Engineer of the date the Contractor intends to start construction.

All costs incidental to the foregoing requirements shall be included in the original contract prices for the project.

**RIGHT OF WAY RESTRICTIONS**

The Contractor shall not enter the listed right of way parcels before the listed date unless otherwise directed in writing by the Engineer:

<b>Parcel Number</b>	<b>Owner Name</b>	<b>Location</b>	<b>Restriction Date</b>
PE-2	Laramie Ridge LLC	West Side of SH 93 approximately 150 Feet from EOP between MP 2.710 and 2.880	3/13/2023
PE-3	Keller Family Limited Partnership LLLP	West Side of SH 93 approximately 150 Feet from EOP between MP 2.945 and 3.130	3/13/2023
TE-2	Laramie Ridge LLC	West Side of SH 93 approximately 100 Feet from EOP between MP 2.785 and 2.905	3/13/2023

The Department anticipates no delay toward completion of the project due to the restrictions imposed herein

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 UTILITIES**

The known utilities within the limits of this project are:

<b>UTILITY</b>	<b>CONTACT/EMAIL</b>	<b>PHONE/FAX</b>
Xcel Energy Application for Gas & Electric Services	BCLCO@xcelenergy.com	1-800-628-2121 1-800-628-2521 Fax



UTILITY	CONTACT/EMAIL	PHONE/FAX
Xcel Energy – Electric and Gas 5460 West 60 <sup>th</sup> Avenue Arvada, CO 80002	Patrick Quinn patrick.s.quinnl@xcelenergy.com	(303) 425-3955
Lumen AKA CenturyLink 5325 Zuni Suite 728 Denver, CO 80221	Kari Rozsa kari.rozsa1@lumen.com	(719) 955-2229 Office
Comcast Cable Corporation 6850 S Tucson Way Englewood, CO 80112	Curtis Stagner curtis_stagner@comcast.com	(720) 281-8638 Cell
Zayo Communications 400 Centennial Pkwy Louisville, CO 80027	James R. Black jamesr.black@zayo.com	(720) 361-1790 Office (303) 517-4191 Cell
City of Golden Water 1445 10 <sup>th</sup> st Golden, CO 80401	Anne Beierle abeierle@cityofgolden.net	(303) 384-8153 Office
CDOT Region 1 Traffic & Electric 18500 E. Colfax Ave. Aurora, CO 80010	Robert Apodaca robert.apodaca@state.co.us	(303) 365-7313 Office
CDOT ITS 425C Corporate Circle Golden, CO 80401	Jill Scott jill.scott@state.co.us	(303) 512-5805 Office (303) 512-5878 Fax

The work described in these plans and specifications requires full cooperation between the Contractor and the utility owners in accordance with Subsection 105.11 in conducting their respective operations, to complete the utility work with minimum delay to the project.

All new underground facilities, including laterals up to the structure or building being served, installed as part of this project must be electronically locatable when installed, in compliance with Colorado Revised Statutes, Title 9, Article 1.5.

All utility installations, within CDOT Right of Way (ROW), shall be collected using CDOT’s mobile application (PointMan). Please contact CDOT at [cdotpointman@gmail.com](mailto:cdotpointman@gmail.com) in order to obtain new login and password information, if required. Download PointMan mobile application through the Apple Store (iOS) or Google Play (Android). Finally, please watch the following quick start guide, the video can be found at the following link: <https://youtu.be/X-tMvnK7vZw>.

**PART 1 CONTRACTOR SHALL PERFORM THE WORK LISTED BELOW:**

Coordinate project construction with the performance by the utility owner of each utility work element listed in Part 2 below. Perform preparatory work specified in Part 2 for each utility work element. Provide an accurate construction schedule that includes all utility work elements to the owner of each impacted utility.

Provide each utility owner with weekly updates to the schedule. Conduct detailed utility coordination meetings prior to each construction phase to coordinate all requirements and schedules, and provide other necessary accommodations as directed by the Engineer. Notify each utility owner in writing, with a copy to the Engineer, prior

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**UTILITIES**

to the time each utility work element is to be performed by the utility owner. Provide the notice with the number of days specified in Part 2 immediately prior to the time the utility work must be begun to meet the project schedule.

Provide traffic control, as directed by the Engineer, for any utility work by the utility owner expected to be coordinated with construction. However, traffic control for utility work outside of typical project work hours shall be the responsibility of the utility owner.

Perform each utility work element for every utility owner listed here in Part 1. Notify each utility owner in advance of any work being done by the Contractor to its facility, so that the utility owner can coordinate its inspections for final acceptance of the work with the Engineer.

### **Project Limits – All Utility Owners**

Prior to excavating, the Contractor shall positively locate (by potholing if necessary) all potential conflicts with existing underground utilities and proposed construction, as determined by the Contractor according to proposed methods and schedule of construction. The Contractor shall modify construction plans to avoid existing underground facilities as needed, and as approved by the Engineer. Please note that UNCC marks only its members' facilities – Other facilities, such as ditches and drainage pipes may exist, and it is the Contractor's responsibility to investigate, locate and avoid such facilities.

The Contractor shall follow the utility standards of the Colorado Department of Transportation (CDOT), as applicable.

### **Xcel Energy – Electric Distribution**

When the Contractor is working near or under the high voltage distribution line, it shall be assumed the distribution line is energized and the Contractor shall not be closer than ten feet (10') in any direction from the energized conductors. If work will be within ten feet (10') of energized conductors, The Contractor shall call Xcel Energy's Builders Call Line Colorado ("BCLCO") 1-800-628-2121 a minimum of thirty (30) days in advance to arrange for an outage. An outage will be arranged if it is determined to be necessary. The outage will be a day-by-day situation. Typically, there is a fee charged when an electrical outage is required. However, this fee shall be waived for this project since the electric facilities are in public right-of-way. Xcel shall not charge a fee for this work.

### **Xcel Energy Power Source Connection (Intersection of SH93 & 58<sup>th</sup> Ave.**

The Contractor shall submit a BCL request when connecting power sources, 90 days in advance to allow Xcel Energy forces adequate administration and processing of the new street lighting and billing. The Contractor shall be responsible for the coordination of power source work to be performed by Xcel Energy. For this project, Pat Quinn is the assigned designer. The Contractor shall contact the Xcel Energy Builder's Call Line at 1-800-628- 2121 or BCLCO@xcelenergy.com to request, and process to completion, the required coordination to for the following work, as shown on the plans.

The Contractor shall perform all work necessary to maintain existing power source for the traffic signal elements as called for in the plans. All cost charges from the power service provider, and all necessary materials, labor and

## **3 UTILITIES**

coordination required to maintain existing or establish new power sources required for permanent operation of roadway elements as shown in the plans shall be reimbursed from the Force Account Furnish and Install Electrical Service.

The Contractor shall coordinate with Xcel Energy to connect the proposed meter to the existing Xcel Energy power source. This work shall be coordinated with construction and will require two (2) working days at each location by Xcel Energy forces to complete.

**Timing:** This work shall be coordinated with construction and will require two (2) working day at each location by Xcel Energy forces to complete. All cost and charges for this work shall be completed through the project Force Account Furnish and Install Electrical Service.

### **Xcel Gas Valve Boxes**

The Contractor shall notify Xcel Gas 2 weeks in advance of construction operations commencing near Xcel Gas facilities.

The Contractor shall provide Xcel Gas written notice 30 days immediately prior to each utility work element expected to be coordinated with construction.

### **Lumen, AKA CenturyLink, Manholes**

The Contractor shall notify Lumen 2 weeks in advance of construction operations commencing near Lumen facilities.

The Contractor shall provide Lumen written notice 30 days immediately prior to each utility work element expected to be coordinated with construction.

### **City of Golden Water**

The Contractor shall adjust Golden Water valve boxes located along SH93 down prior to rotomilling as shown on the plans.

The Contractor shall adjust Golden Water valve boxes up to 1/4" to 1/2" below finished roadway elevation as shown on the plans.

All Valve Boxes will be cleaned per CDOT 202 Spec, Clean VB

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### **UTILITIES**

The Contractor shall notify the utility owner 5 days immediately prior to required inspections of utility work performed by the Contractor.

The Contractor shall provide the utility owner written notice 30 days immediately prior to each utility work element expected to be coordinated with construction.

**Timing:** The Contractor shall notify Golden Water two weeks in advance of construction operations commencing near Golden Water facilities. The Contractor shall coordinate inspections with Golden Water. The Contractor shall provide the utility owner written notice 5 days immediately prior to required inspections.

**PART 2 UTILITY OWNERS SHALL PERFORM THE WORK LISTED BELOW:**

Although the Contractor shall provide traffic control for utility work expected to be coordinated with construction, traffic control for utility work outside of typical project work hours shall be the responsibility of the utility owner. The utility owner shall prepare and submit to the CDOT Engineer a Method of Handling Traffic for utility work to be performed outside typical project work hours. The utility owner shall obtain acceptance of the Method of Handling Traffic from the CDOT Engineer prior to beginning the utility work to be performed outside typical project work hours.

**Xcel Energy Power Source Connection (Intersection of SH93 & 58<sup>th</sup> Ave.**

Xcel Energy shall connect the new signals to an Xcel Energy electric meter. Xcel Energy forces shall install the meter and make the final connection to the metered power sources near the SE Corner of SH93 and 58<sup>th</sup> Ave, as shown on the Electrical plans. This work shall be coordinated with construction and will require two (2) working day at each location by Xcel Energy forces to complete. All cost and charges for this work shall be completed through the project Force Account Furnish and Install Electrical Service.

**Xcel Gas Valve Boxes**

The Contractor shall notify Xcel Gas 2 weeks in advance of construction operations commencing near Xcel Gas facilities.

The Contractor shall coordinate the adjustment of Xcel Gas Valve Boxes by Xcel Forces down prior to rotomilling, as shown in the plans.

The Contractor shall coordinate the adjustment of Xcel Gas Valve Boxes by Xcel Forces up to ¼” to ½” below finished roadway elevation, as shown on the plans.

The Contractor shall provide Xcel Gas written notice 30 days immediately prior to each utility work element expected to be coordinated with construction.

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UTILITIES**

This work is expected to be completed in coordination with construction and take 1 working days at each location to complete.

**Lumen, AKA CenturyLink**

The Contractor shall coordinate the adjustment of the Lumen manhole by Lumen Forces down prior to rotomilling, as shown in the plans.

The Contractor shall coordinate the adjustment of the Lumen manhole by Lumen up to ¼” to ½” below finished roadway elevation, as shown on the plans.

The Contractor shall provide the utility owner written notice 14 days immediately prior to each utility work element expected to be coordinated with construction.

This work is expected to be completed in coordination with construction and take 1 working days at each location to complete.

**The work listed above is to be performed at no cost to the project.**

**There will be no change in the final roadway elevations at the manhole locations.**

**City of Golden Water**

The Contractor shall coordinate and conduct, with the Engineer and each Owner, a final inspection upon completion of construction. This inspection shall assure that all valve boxes and manholes are in compliance with these requirements. The Engineer will obtain the Owner’s written approval before accepting the work.

**GENERAL:**

The Contractor shall comply with Article 1.5 of Title 9, CRS ("Excavation Requirements") when excavating or grading is planned in the area of underground utility facilities. The Contractor shall notify all affected utilities at least two (2) business days, not including the actual day of notice, prior to commencing such operations. The Contractor shall contact the Utility Notification Center of Colorado (UNCC) at phone no. 811, to have locations of UNCC registered lines marked by member companies. All other underground facilities shall be located by contacting the respective owner. Utility service laterals shall also be located prior to beginning excavation or grading.

Utilities are depicted on these plans in accordance with their achieved “Quality Levels” as defined in the American Society of Civil Engineer’s document ASCE 38, “Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data.” The Contractor’s attention is directed to subsection 105.11 of the Standard Specifications concerning utilities.

The location of utility facilities as shown on the plan and profile sheets, and herein described, were obtained from the best available information.

All costs incidental to the foregoing requirements will not be paid for separately but shall be included in the work.