3.0 QUALITY MANAGEMENT

This Section 3 includes the requirements for the quality management Work for the Region 2 Bridge Bundle Design Build Project (Project). This Work shall be completed in accordance with the Contract Documents.

The Contractor shall be responsible for implementation and maintenance of an effective quality program to manage, control, document, and assure all obligations of the Contractor comply with the requirements of the Contract Documents for the Project. The Quality Management Plan (QMP) shall encompass all Work performed by the Contractors of all tiers and the Project's overall Quality Assurance program, including, at a minimum, a Design Quality Management Plan (DQMP) and a Construction Quality Management Plan (CQMP).

The QMP shall describe in detail the quality processes for internal checks, reviews, audits, responsibility and authority, and resolutions to occurrences of nonconformance to Contract requirements. The QMP shall address the responsibility and Approval authority of the Colorado Department of Transportation (CDOT) and outline processes for addressing issues related to elements of Work that do not comply with the Contract. The CDOT review time for all submittals is 14 Days, except for review times specifically identified in the Contract. The QMP shall include the Contractor's quality policy, quality planning, and quality improvement processes. The QMP shall include an approach to Process Control (PC) relative to design, construction, civil rights and Work management. The QMP shall address all actions to ensure a successful quality program integrated with CDOT's Owner Acceptance (OA) testing, which will be performed on construction Activities as defined in this Section. All other Quality actions are the responsibility of the Contractor.

The QMP shall be in effect until Final Acceptance and shall address the responses to Warranty issues during the Warranty period.

3.1 Administrative Requirements

The Contractor shall submit the DQMP to CDOT for Approval prior to issuance of First Notice to Proceed (NTP1). CDOT will deliver its Approval or rejection and provide comments on the initial DQMP submission within 14 Days following CDOT's receipt of the DQMP. The Contractor shall revise and resubmit the DQMP within 7 Days of receiving CDOT's rejection and comments.

The Contractor shall submit the sections of the CQMP prior to the issuance of Second Notice to Proceed (NTP2).

The entire QMP (including the DQMP and CQMP) for all of the Work on the Project must have CDOT's Approval before NTP2 will be issued. CDOT will deliver its Approval or rejection and provide comments on the full QMP submission within 21 Days following CDOT's receipt of the QMP. The Contractor shall revise/resubmit its full QMP within 14 Days upon notification by CDOT of rejection and comments.

The QMP shall be reviewed by the Contractor's executive management, Quality Control Administrator (QCA), and CDOT during the course of the Project, but no less than every 6 months, to ensure its continued suitability, adequacy, and effectiveness. Such reviews should include PC/OA results, status of corrective/preventative actions, quality trends, follow-up items

from previous reviews, changes to the QMP, and recommendations for improvement. The Contractor shall submit all revisions of the QMP to CDOT for Approval prior to implementing any QMP modifications.

3.1.1. Quality Policy

The QMP shall include the Contractor's executive management written definition and endorsement of the Contractor's policy for quality, including QMP objectives, and its commitment to quality. The QMP shall delineate procedures used by the Contractor's executive management to implement the Contractor's quality policy. The Contractor's executive management shall ensure its policy is implemented at all levels of the Project organization.

The Contractor shall publish and post a statement of its commitment to quality and the organization's quality objectives in several locations throughout the Project. Posted locations shall be such that the statement is visible to employees and Subcontractors. The statement shall explain the Contractor's commitment to quality and the responsibility the Contractor has for ensuring that it meets the quality requirements for the Project.

3.1.2. Quality Planning

The Contractor shall include in the QMP its planning methods to meet the requirements of the Contract. The Contractor shall include the following tasks, at a minimum, in its quality planning efforts to ensure continued conformance to Contract requirements:

1. Identify the necessary processes, resources, and personnel that are needed for Design PC, Design Quality Assurance (QA), and Construction PC to ensure the Work meets the requirements of the Contract.
2. Develop processes to ensure all project personnel are trained in the implementation of the QMP.
3. Include procedures to develop and maintain the currency of the PC and quality improvement.
4. Identify and define all measurable Contract requirements.
5. Develop procedures for preparation, control, Approval, and distribution of the QMP.
6. Develop procedures for internal quality auditing to ensure the Contractor employees, Subconsultants, Subcontractors, and Suppliers understand and are effectively implementing the QMP. The Contractor shall audit the implementation of the QMP on a quarterly basis.
7. Identify the process to ensure the Contractor's executive management approves and endorses the QMP and reviews the implementation of QMP throughout the duration of the Project.

3.1.3. Communication

The Contractor and CDOT will provide complementary support of all functions, personnel, and goals of the QMP. The Contractor shall identify and implement processes and procedures that foster communication with CDOT and all stakeholders of the Project.

The Contractor shall include in the QMP, a process to notify CDOT in advance of all items

requiring QA, Inspection, and/or testing.

3.1.4. Quality Improvement

The Contractor shall establish, document, and implement a program for quality improvement. The Contractor shall include in the QMP the methods for identifying, analyzing, evaluating, and implementing solutions to continuously improve quality. The QMP shall establish and maintain specific procedures to ensure a successful quality improvement program.

The Contractor's quality improvement program shall include internal quality audits and regularly scheduled quality meetings with staff and supervisors to discuss quality issues.

3.2 General Roles and Responsibilities

3.2.1. Contractor Roles and Responsibilities

The Contractor shall establish, document, and implement the QMP. The QMP shall include all procedures necessary for the Contractor to control the quality of its design and construction processes to meet the requirements of the Contract. The QMP shall include a testing and inspection schedule to control the construction processes.

The Contractor shall provide a PC team to implement, monitor, assess, and adjust the production to ensure the final products meet the Contract requirements.

The Contractor shall provide a qualified design quality team that shall oversee the design processes of the Project by conducting design reviews, providing review documentation, and coordinating with the Contractor and CDOT to ensure the design meets the requirements of the Contract. The Contractor shall provide QA for the design quality process.

3.2.2. CDOT Roles and Responsibilities

CDOT will retain responsibility for the Owner Acceptance (OA), as required by Title 23, Code of Federal Regulations, Part 637 (23 CFR 637). ~~CDOT will include the results of the Contractor's PC Testing in its acceptance decisions.~~

CDOT will provide a qualified construction OA team to perform QA auditing and acceptance testing. The CDOT construction OA will perform on-site inspection and testing of the construction elements of the Work to verify all Work has been constructed in conformance with the Contract requirements, following the requirements of the CDOT *Field Materials Manual*.

CDOT will perform Independent Assurance Activities to confirm the sampling and testing Activities performed by the OA and the Contractor's PC at CDOT's discretion are conducted by qualified personnel using proper procedures and properly calibrated and functioning Equipment.

3.3 Personnel Requirements

The Contractor shall include in the QMP an organizational chart that illustrates a commitment to implementing an effective QMP to ensure all Work meets the requirements of the Contract. The QMP shall describe the hierarchy of the Contractor's organization. The QMP shall graphically depict the principal quality participants, showing lines of responsibility, authority, and communication with CDOT, other involved agencies, Subconsultants, Subcontractors, and Suppliers and any other team members having a significant quality role.

The Contractor's executive management shall have overall responsibility for successful execution of the QMP and shall ensure responsibilities and authority are defined and communicated within its organization. The Contractor shall identify a Quality Control Administrator (QCA) that reports directly to executive management and shall be responsible for all Contractor design and construction quality Activities for the Project. The QCA shall not be responsible for the management and direction of PC Activities.

3.3.1. Training

The Contractor shall establish and maintain documented procedures for identifying training needs and requirements for the implementation of the QMP and shall provide training of all personnel performing Activities affecting quality. Personnel performing specifically assigned tasks affecting quality shall be trained in the specific plans, processes, and procedures as assigned in the QMP.

The QMP shall specify procedures that:

1. Familiarize all personnel with all requirements of the Contract Documents, including the proposal documents, pertaining to their responsibilities.
2. Educate, train, and certify (as appropriate) personnel performing activities affecting or measuring the quality of the Work and ensure they achieve and maintain reasonable proficiency.
3. Ensure personnel performing the Work do so according to the QMP and all other Contract Documents.
4. Provide formal training on the proper use and procedures for document control prior to implementation.
5. Provide documentation verifying all training efforts and activities.

The Contractor shall provide training to all personnel that may interface with CDOT's OA efforts to ensure they understand their roles and responsibilities for cooperating and responding to CDOT OA Activities.

Quality training shall precede the associated Work.

3.4 Documentation

Document management and control shall conform to the Contract requirements, including Book 2, Section 2.

3.4.1. Documentation Control

The Contractor's team and CDOT's personnel shall maintain construction workmanship and materials quality records of all Inspections and Tests performed. These records shall include factual evidence the required Inspections and Tests have been performed, including type and number of Inspections or Tests involved; results of Inspections or Tests; nature of defects, deviations, causes for rejection, proposed remedial action; and corrective actions taken.

The Contractor shall store and maintain all Contractor's quality documentation in the Contractor's Document Control System (DCS). The QMP shall include the proposed file

structure and naming conventions for all required quality documentation. The Contractor shall provide CDOT access to the Contractor's DCS to access all quality documentation. The Contractor shall submit to CDOT all quality documentation with each structure segment completion.

The QMP shall identify (by name) the document control supervisory personnel for the maintenance and management of records and documents for the Contractor.

The Contractor's Construction Quality Manager (CQM) shall maintain a daily log of all Inspections performed for both Contractor and Subcontractor PC operations. The daily inspection reports shall identify Inspections conducted, dates of inspections, results of inspections, locations and nature of defects found, causes for rejection, and remedial or corrective actions taken or proposed. The responsible technician and the technician's supervisor shall sign the daily inspection reports. These daily inspection reports shall document the day's events, Activities, and discussions in a format consistent with the requirements contained within CDOT*'s Field Materials Manual* and CDOT's *Construction Manual*.

To enhance coordination of CDOT's QA and OA Activities during construction, the Contractor shall provide CDOT a weekly look-ahead of specifically scheduled construction Activities, designating the location and planned quantities of Materials to be placed and the protocols for identifying completed construction Work. The Contractor shall also provide CDOT the actual construction Activities conducted during the previous week, designating location and quantities of Materials that were placed. The Contractor shall provide this information to CDOT at weekly status meetings both electronically and in hard copy format.

The Contractor's records shall include a master list of approved design submittals, revisions, Field Design Changes (FDC), Notice of Design Changes (NDC), and Requests for Information (RFI). The QMP shall include a process to communicate design changes to both the Contractor and CDOT on a timely basis consistent with the progress of construction Activities.

3.4.2. Request for Information

The QMP shall define a method to control the RFI process for issues generated by both the Contractor and Third Parties and identify the party responsible for providing the RFI response. CDOT shall be included in the distribution of all RFIs and RFI responses. If Nonconforming Work is discovered through the RFI process, it shall be addressed with the Nonconforming Work process described in Section 3.6.

Field Code Changed

3.4.3. Design Review Documentation

The QMP shall outline a process to document the results of all design reviews and comment resolution meetings.

The Contractor's process shall include, at a minimum, a record of the following information, which shall be provided to CDOT in accordance with Book 2, Section 3:

1. List of the participants in each review or meeting.
2. Record of all items discussed.
3. Discrepancies noted and reports on corrective action(s) taken or planned.

4. Follow-up action items, due dates, and the responsible party.
5. Items needing resolution and time constraints for resolution.

3.4.4. Quality Status Reports

The QMP shall outline a reporting process for recording, organizing, and distributing a record of internal quality activities. These Quality Status Reports shall be issued by the QCA and distributed to the Contractor's and CDOT's management personnel. The Contractor shall submit the Quality Status Reports to CDOT for Review with each Monthly Invoice submittal. The reports shall include the following:

1. A summary of internal quality Activities.
2. A summary of the status of all RFIs.
3. A summary of the status of all NDCs and FDCs.
4. A summary of the status of all Nonconforming Work.
5. A summary of any corrective and preventative actions.
6. A summary of any quality trends, both positive and negative, as applicable.
7. Materials Testing and Inspection Plan (MTIP) results (both cumulative and monthly).

3.5 Design Quality

The QMP shall include a DQMP to describe specific procedures to be followed to ensure all the designs conform to the requirements of the Contract and to the design documents being used as the basis of construction.

The DQMP shall describe design quality management practices and processes that:

1. Specify quality procedures for preparing and checking all plans, specifications, calculations, reports and other documentation.
2. Specify procedures for verifying computer programs used and their input and output.
3. Control and independently ensure the design meets the requirements of the Contract.
4. Identify and track Design Document deliverables.
5. Provide for the Approval, tracking, and recording of revisions to Design Documents.
6. Provide a formal procedure for comment resolution included in the QMP.
7. Provide procedures for Approval of Released for Construction (RFC) Documents.

The Contractor's DQMP shall include two primary elements: design process quality control; and independent design quality control and audits.

The Contractor's DQMP shall also include a process for field verification of as-constructed conditions and subsequent incorporation into the As-Constructed Documents.

3.5.1. Design Process Control

Design Process Control shall include the following Activities:

1. Quality Process Control checking of design calculations.

2. Quality Process Control checking by discipline of milestone design packages (Preliminary Design Plans, RFC Documents, Final Design Documents, and As-Constructed Documents).
3. Quality Process Control reviews of studies, reports, and other design supporting documents.
4. Interdisciplinary reviews of milestone design packages (including regulatory compliance).
5. Constructability reviews of milestone design packages.
6. Log of design changes.
7. Design software validation.

All design process quality control Activities shall be well defined in the DQMP and shall be fully documented processes.

3.5.2. Independent Design Quality Control and Audits

Independent design quality control and audits shall include the following Activities:

1. Audits of all the design process quality control Activities related to the release of each specific design milestone package performed and documented to ensure the package quality prior to its final release. Audits shall be performed by the Design Quality Manager (DQM) and reviewed and approved by the QCA.
2. Independent technical reviews.
3. Independent Structure reviews where required by the Technical Requirements or the Approved DQMP.

3.5.3. CDOT Design Acceptance

Ultimately, CDOT Design Acceptance will be through the Acceptance of the Final Design Documents. To facilitate the Acceptance of the Final Design Documents, CDOT will perform in-progress acceptance activities, including:

1. Monitoring the adequacy of the DQMP.
2. Over-the-shoulder, in-progress design reviews.
3. Formal design reviews of milestone design packages using comment resolution forms, which shall be maintained as a database by the Contractor.
4. Audits of the resolution of design review comments through comment resolution forms.

3.5.4. Preliminary Design Plans

The Contractor shall prepare Preliminary Design Plans (at approximately 30% design completion) showing how the Contractor's design meets the Book 2, Section 1 requirements. The Contractor shall submit the plans to CDOT for Review a minimum of 14 Days, excluding Holidays, prior to the review meeting. CDOT Review of the Preliminary Design Plans will not relieve the Contractor from compliance with any of the Project design requirements that may not be adequately addressed or are incorrectly addressed in the plans. The Preliminary Design Plans shall include at a minimum:

1. General: cover sheet, typical sections
2. Roadway: geometric layouts, roadway plans and profiles with limits of construction (toes of slope/tops of cut), cross-sections (100-foot maximum interval)
3. Structures: general layouts, Bridges, Concrete Box Culverts (CBCs), Arch Structures, major drainage structures, retaining wall layouts, structures typical sections
4. Drainage: master drainage plan and profiles with contours and locations and type of structures, structure hydraulic information
5. Traffic Control: phasing plans, detour plan and profile with limits of construction (toes of slope/tops of cut)

The Contractor shall include the three-dimensional (3-D) model of the design with this submittal.

3.5.5. Released For Construction Documents

RFC Documents allow the Contractor to initiate construction in advance of CDOT's Acceptance of the Final Design Documents. The QMP shall identify the procedure for releasing RFC Documents, including a discussion of the specific roles of the Contractor's Project Manager, QCA, DQM, CQM, and Design Manager. The QMP shall identify a specific process for CDOT's Review of the RFC Documents and review by any other Agencies that will ultimately have acceptance or approval authority for the Work and the Final Design Documents.

3.5.5.1 Pre-RFC Documents (100%)

RFC Documents shall be submitted initially to CDOT as Pre-RFC Documents (100%), a minimum of 14 Days, excluding Holidays, prior to the review meeting. The Review process shall include a comment resolution process for documenting all review comments affecting the RFC Documents and their resolution prior to the submittal of Final RFC Documents to CDOT. The Pre-RFC Documents shall include plan quantities following standard CDOT item naming conventions to facilitate both PC and OA. The Pre- RFC Documents shall also include all applicable inspection hold points from the QMP.

3.5.5.2 Final RFC Documents

The DQM shall provide documented assurance with the submittal of the Final RFC Documents that all comments received on the Pre-RFC Documents have been resolved and the submittal meets all Technical Criteria. The Contractor shall submit the DQM assurance with the Final RFC Documents to CDOT for Acceptance a minimum of 10 days prior to construction of the applicable Work provided that no significant changes, as determined at CDOT's sole discretion, have been made to the plans since the Pre-RFC Documents submittal. The RFC Documents shall include plan quantities following standard CDOT item naming conventions to facilitate both PC and OA. The RFC Documents shall also include all applicable inspection hold points from the QMP. The Contractor's QCA shall approve the Final RFC Documents prior to their release.

CDOT's Acceptance of partial designs within the Final RFC Documents will not constitute Acceptance of the overall design or subsequent construction, nor relieve the Contractor of its responsibility to meet the Contract requirements. Irrespective of whether CDOT provides the Contractor with the authority to begin construction on elements of the Project prior to completion of the entire design, the Contractor shall bear the responsibility to ensure construction meets the requirements of the Contract Documents, applicable law, and the Governmental Approvals.

The QMP shall include a process for a Colorado licensed Professional Engineer(s) in responsible charge for the design to review, approve, and seal all Final RFC Documents prior to their issuance and review; and to approve and seal revisions to previous versions of RFC Documents.

3.5.6. Design Changes after Plans have been Released for Construction

The QMP shall outline the design, review, and approval method for issuing NDCs or FDCs after the Final RFC Documents have been released. Design changes are new or revised items of Work that were not included in the Final RFC Documents. NDCs and FDCs must go through a formal and documented design review process. All NDCs and FDCs shall be approved by a Colorado licensed Professional Engineer(s) in responsible charge of the original design(s).

The QMP shall include a process to propose, notify, receive, track, respond to, and distribute design changes; the participants and their associated responsibilities; and a Work process for each change. CDOT will Review all design changes. The Contractor shall invite CDOT to all reviews. The Contractor and CDOT shall jointly determine the procedures and timing of reviews, with the mutual understanding that a timely and expeditious design change process benefits all parties, balanced with the quality of the end product.

CDOT Acceptance will be required for all NDC and FDC documents, prior to Release For Construction.

3.5.7. Working Shop and Falsework Drawings

The Contractor shall outline the process in the QMP for how working drawings, shop drawings, and falsework drawings are prepared, reviewed, and corrected. The process outline shall include:

1. Personnel assigned to perform construction submittal reviews.
2. Procedures for documenting reviews and approvals and for obtaining corrective action.

The QMP shall include a process for a Colorado licensed Professional Engineer(s) in responsible charge for the design to review, approve, and seal all shop drawings and falsework drawings prior to their issuance in accordance with CDOT *Standard Specifications for Road and Bridge Construction*. All approved and sealed shop drawings and falsework drawings shall be submitted to CDOT for Review.

3.5.8. Method for Handling Traffic Drawings

The Contractor shall outline the process in the QMP for how the Method of Handling Traffic (MHT) drawings are prepared, reviewed, and corrected. The process outline shall include:

1. Personnel assigned to perform construction submittal reviews.
2. Procedures for documenting reviews and approvals and for obtaining corrective action.

MHT drawings shall be submitted to CDOT for Acceptance in accordance with Book 2, Section 16.

3.5.9. Final Design Documents

The Contractor shall submit Final Design Documents to CDOT for Review and Acceptance. The Contractor shall ensure and provide documentation to CDOT that all review comments have been addressed. The Final Design Documents shall include a complete, final assembled design set that includes the latest RFC plans incorporating all NDC, FDC, RFI's and all required design documentation. CDOT will not Accept the Final Design Documents until the Contractor has completed all design and has addressed, resolved, and incorporated any prior Contractor, Third Party, and/or CDOT Acceptance review comments to the satisfaction of CDOT. If deemed necessary by CDOT, the Contractor shall resubmit revised Final Design Documents until such time that CDOT determines the Review comments have been satisfactorily addressed.

The Final Design Documents submittal shall include, at a minimum:

1. All sealed design plans.
2. Design calculations.
3. Design reports.
4. Specifications.
5. Estimated quantities.
6. Computer-Assisted Drafting and Design (CADD) files and the three-dimensional (3-D) model of the design with this submittal.

3.5.10. As-Constructed Documents

As-Constructed Documents shall be submitted to CDOT for Acceptance with each structure segment completion. The Contractor shall provide documentation to CDOT that all outstanding issues have been addressed. CDOT will assess As- Constructed Documents to ensure completeness and compliance with the requirements of the Contract. CDOT will not Accept As-Constructed Documents until the Contractor has adequately addressed any prior Contractor PC reviews, QA audits, and CDOT inspections/testing.

The As-Constructed Documents submittal shall include, at a minimum:

1. All plans reflecting RFC Documents and any revisions to RFC Documents, including all RFIs, FDCs, NDCs, the Contractor's log of design changes, and As-constructed survey items as required in the CDOT *Survey Manual* and Book 2, Section 9.
2. Resolution of prior Contractor QC audits, QA audits, or CDOT audits, including completed comment resolution forms demonstrating all formal meeting review comments have been fully addressed through the design and construction of the Project.
3. Design calculations.
4. Design reports.
5. Specifications.
6. CADD files.

3.5.11. Design Coordination

The QMP shall describe how the design team schedules design efforts, including, but not limited to, task force meetings, design reviews, constructability reviews, design meetings, independent design checks, and a schedule for RFC Documents, Final Design Documents, and As-Constructed Documents.

The Contractor shall conduct weekly task force meetings to coordinate the design development within the Contractor's organization, CDOT, and other affected agencies. At a minimum, the Contractor shall prepare an agenda and conduct each meeting to discuss the status of the design, coordinate the design development between design disciplines, discuss constructability issues, and identify any questions associated with design requirements. The Contractor shall maintain an action and decision log for all task force meetings and provide the log to CDOT within 3 Days after each meeting.

The Contractor shall hold joint design milestone review meetings for the Preliminary Design Plans, Pre- and Final RFC Documents, NDC and FDC documents, Final Design Documents, As-Constructed Documents, and other milestone reviews deemed appropriate by the Contractor or requested by CDOT. The design progress meetings shall be scheduled, conducted, and documented by the Contractor. The Contractor shall maintain an action and decision log for all design milestone review meetings and provide the log to CDOT within 7 Days after each meeting. The Contractor shall provide review documents stamped "Checked and Ready for Review."

The DQM shall keep CDOT updated on the schedule of all upcoming milestone reviews at least 14 Days in advance of review meetings. Milestone review meetings shall not be scheduled within intervals of less than 7 Days, unless otherwise approved by CDOT.

3.6 Construction Quality

The Contractor shall be responsible for performing and documenting all required construction PC Activities necessary to control the Work, which shall be documented within the QMP as the CQMP. The CQMP shall cover both permanent and temporary Work.

The CQMP shall include the following:

1. Specific procedures to be followed to ensure all Work conforms to all the requirements of the Contract and of the design documents being used as the basis of construction; and that all Materials, Equipment, and elements of the Work incorporated in the Project will perform satisfactorily for the purpose intended.
2. Specific procedures for inspections, sampling, test procedures, checking, and documenting the Work, including all Work performed by Subcontractors, and for distribution of information (e.g., RFC Documents, design changes, Nonconformance Report [NCR] remediation) to all necessary parties. The CQMP shall include a procedure on how construction changes (e.g., NDCs, FDCs, RFIs) are documented for inclusion in the As-Constructed Documents.
3. Provisions to ensure the requirements of CDOT *Standard Specifications for Road and Bridge Construction* Section 105.18—Load Restrictions with regard to all Material, including Material quantified by weight or volume, are adhered to.
4. Provisions to ensure the quality and safety of safety-critical Work.

3.6.1 Construction Process Control

The Contractor shall establish, document, and implement a PC Plan as part of the CQMP. The PC Plan shall include all procedures necessary for the Contractor to control the quality of its production processes to meet the requirements of the Contract. The Contractor shall develop a test and inspection schedule to control the production processes.

All PC personnel shall be capable of performing all field and laboratory Inspections and Tests they are assigned. All testing personnel shall be properly certified. The Contractor shall have enough qualified personnel to handle ~~to~~ the workload. The Contractor shall provide the Equipment and facilities to perform all Tests. The PC labs shall be certified and on the American Association of State Highway and Transportation Officials (AASHTO) Materials Reference Laboratory (AMRL) accredited list.

PC staff shall:

1. Be responsible for quality of the Work during production.
2. Have authority to stop Work.

The PC Plan shall include PC checklists. The Contractor shall use current CDOT forms, manuals, and handbooks to develop PC checklists that are organized for the execution of Work Breakdown Structure (WBS) Activities and all other associated Contract requirements. The Contractor shall maintain the checklists at the Project Site and be available for CDOT review at all times. Unmaintained or outdated PC checklists will constitute Nonconforming Work. Work shall not proceed until the PC checklist is updated and made compliant to this Section.

3.6.1.1 Materials Testing and Inspection Plan

The Contractor shall prepare and implement a Materials Testing and Inspection Plan (MTIP) as part of the QMP. The MTIP shall include the appropriate criteria, Test Procedures, and Inspection requirements identified in the CDOT *Construction Manual,* CDOT *Field Materials Manual*, CDOT *Standard Specifications for Road and Bridge Construction*, and this RFP.

The MTIP shall identify all inspections and tests required, including, at a minimum, reference to the requirements of the Contract and frequency of the inspections and tests. Where no inspections or test standard exists in any of the CDOT manuals, the MTIP shall develop criteria based on the best-available industry standard information and technology.

The MTIP shall include:

1. Contractor-developed Inspection checklists of requirements.
2. All PC Inspections and Tests required, including, at a minimum, reference to the requirements of the Contract, frequency of the Inspections and Tests, and the Contractor-developed PC processes. Where there is no Inspection or Test standard in any of the CDOT manuals, the MTIP shall include criteria based on the best-available industry standard information and technology.
3. A summary of Activity-specific Material quantities to document that the minimum sampling, testing, and inspection requirements have been met. This summary shall be documented on each structure segment CDOT Form 250 and provided to CDOT with the monthly Quality Status Report.

4. Processes to control, calibrate, and maintain both field and laboratory Test Equipment to ensure the Equipment meets industry standards and other applicable requirements.
   A. Test Equipment used by the Contractor shall be of a quality and capacity that ensures measurements made are to levels of accuracy and precision required by the Test procedure.
5. Procedures for delivery, handling, and storage of furnished products that ensure they are properly handled and stored to prevent damage, deterioration, or theft.
6. Detailed Inspection procedures to be used in cases where Inspections are to serve as the basis for verifying compliance with the requirements of the Contract.

3.6.1.1.1 Inspection

The Contractor shall conduct each Inspection in accordance with the Approved QMP. The Contractor shall document whether the Inspection passed or failed based on the “pass/fail criteria” established in the procedure and the requirements of the Contract (e.g., concrete depth checks on deck pours, rebar clearance/size, locations, elevations, stationing). The Contractor shall include failing Inspection results in the Inspection documentation.

The Inspection documentation shall be submitted to CDOT for Review within 48 hours following the Inspection.

3.6.1.1.2 Testing

At a minimum, the Contractor shall follow the requirements of Book 2, Section 19; the CDOT *Field Materials Manual*; the Project Specifications; and the CDOT *Field Materials Manual* Frequency Guide Schedule for Minimum Materials Sampling, Testing, and Inspection identified under the column titled “Project Verification Sampling and Testing Frequency.”

The Contractor shall document the results and show if the Test passed or failed based on the "pass/fail criteria" established in the Contract. The Contractor shall include failing Test results in the Test documentation.

At a minimum, the Contractor shall document results of tests in report format that includes the following:

1. Contract or project identification number.
2. Identification of items tested.
3. Quantity represented.
4. Date and time test conducted.
5. Location of items tested.
6. Test procedure used.
7. Name of technician.
8. Acceptance criteria.
9. Results.

10. Authorized signature.

The Test data and results shall be submitted to CDOT for Review within 48 hours following the Test.

3.6.1.2 Product Control Plan

The Contractor shall prepare and implement a Product Control Plan (PCP) as part of the QMP. The PCP shall include procedures for the Contractor to inspect and test, where applicable, procured products from Suppliers during the manufacture, receiving, and installation of the products to ensure the requirements of the Contract Documents are met. The Contractor shall follow the Buy America requirements.

The PCP shall include QA Activities at manufacturing and fabrication sites, as required by the CDOT *Field Materials Manual*. CDOT may designate hold points in the manufacturing and installation process.

In accordance with the CDOT *Field Materials Manual*, the PCP shall include procedures to document and demonstrate product compliance with requirements of the Contract documents by Certificates of Compliance (COC) or Certified Test Reports (CTR). The Contractor shall obtain COCs and CTRs prior to installing products and before including them on the Monthly Invoice. Certification shall be according to requirements of the Contract.

The Contractor shall maintain a complete log of all COCs and CTRs, per the CDOT *Field Materials Manual*. The Contractor shall include in the COC and CTR log the signed certification that all Materials represented by each COC and CTR were installed in the Work. The log and all COCs and CTRs shall be available for CDOT's Verification at any time. The Contractor shall submit to CDOT for Acceptance all COCs and CTRs to CDOT with each structure segment completion.

The PCP shall include procedures for delivery, handling, and storage of furnished products, ensuring that they are properly handled and stored to prevent damage, deterioration, or theft. The PCP shall document procedures for stored items and materials consistent with the expected duration and type of storage.

The PCP shall include procedures for monitoring special processes utilized in fabrication, assembly, and testing of specified products. Special processes are those requiring qualified/certified production, inspection, and testing personnel to perform highly skilled Work, such as welding, brazing, soldering, non- destructive testing, machining, coating, or plating.

3.6.1.3 Specialized Manufacturing Facilities and Products

Specialized manufacturing facilities may be required to supply items or materials. The QMP shall specify how the Contractor shall ensure that specialized manufacturing facilities meet requirements established by CDOT. These requirements include, but are not limited to, the following:

1. How manufacturing facilities will be selected.
2. How the Contractor and the CDOT QA team will determine the inspection requirements of the facility (e.g., initial capabilities of the facility, ongoing process and production, final product certification and documentation, delivery and handling

processes, etc.).

3. The lead times required for on-Site Inspection of the facilities. CDOT requires a 30-Day lead time to make travel arrangements for facility Inspection.
4. Sampling and Test requirements of the final product.

3.6.1.4 Hold Point Inspection

A hold point is a point in time when construction has proceeded to a defined stage and at which representatives of the Contractor's production, Contractor's PC, and CDOT's QA staff determine the conformance of the Work up to that point. The Contractor shall provide a daily summary to CDOT of the next day's planned construction activities by 4:00 p.m. to facilitate CDOT oversight activities.

With the exception of corrective work items, no additional Work may take place past the hold point until the Work conforms to the requirements of the Contract.

The QMP shall identify construction hold points for the Contractor's quality efforts. The QMP shall specify processes for monitoring the progression of Work, including associated quantities of materials, through the tracking of hold points. The process should be designed to aid in progressing Work, verifying payments, and avoiding duplicate inspection, testing, and reporting.

CDOT may identify additional hold points to be included at any time during the Project. CDOT and the Contractor will coordinate to define the procedures and criteria for additional hold points.

3.6.1.5 Specific Inspection Procedures

3.6.1.5.1 Deep Foundations

The QMP shall detail the Contractor's process for monitoring and inspecting all elements of the Work required by the Contract related to drilled shafts, driven piles, and micropiles.

3.6.1.5.2 Embankment

The QMP shall detail the Contractor's process for monitoring and inspecting all elements of the Work required by the Contract related to placement of embankment material. Monitoring shall include long-term measurements of settlement of embankment fill and compressible native soils beneath embankments.

3.6.1.5.3 Structural Steel

The QMP shall detail the Contractor's process for inspecting structural steel components produced off Site at a fabricator and any structural steel connections that may need to be made on-site.

3.6.1.6 Nonconforming Work

The Contractor shall coordinate with CDOT OA to include in the QMP procedures to develop and maintain a system to identify, control, remedy, and report Nonconforming Work, including Nonconforming Work identified by PC testing and Inspection and CDOT OA. The QMP shall

include procedures to identify Nonconforming Work and to withhold progress payment requests on the Monthly Invoice until the Nonconforming Work is remedied. The Contractor shall remedy Nonconforming Work in accordance with the QMP. The responsibility for review and disposition of Nonconforming Work shall be established in the QMP.

The Contractor shall identify Nonconforming Work by completing an NCR that shall include:

1. Identification of Nonconforming Work, including tagging Work products and location.
2. Description and evaluation of the Nonconforming Work.
3. Identification of the Contractor's crew/foreman responsible for the Nonconforming Work.
4. Applicable Contract requirements.
5. Cause of Nonconforming Work.
6. Recommendation for "remove and replace," "repair," or "use as is" dispositions.
7. Cost adjustment recommendations (if applicable).
8. Cause of Nonconforming Work.
9. Proposed corrective action to prevent recurrence.
10. Responsibility for accomplishing corrective action.
11. Schedule of Work and a date of remedy completion.
12. Signature lines for the Engineer in responsible charge, QCA, and CDOT verifying that the recommended remedy for Nonconforming Work has been approved.

The recommended remedy for the Nonconforming Work shall be approved by the Contractor's Engineer responsible for the work and the QCA prior to its submittal to CDOT. The Contactor shall not perform the recommended remedy prior to receiving from CDOT a determination of "repair" and "use as is" dispositions. For "repair" and "use as is" dispositions, the NCR shall clearly identify if and how the remedy is out of compliance with the Contract requirement and why its nonconforming use is acceptable.

The Contractor shall develop and maintain a Nonconforming Work log to track and identify the status of Nonconforming Work. An updated log shall be submitted to CDOT weekly for Acceptance and shall be used by the Contractor to look for Nonconforming Work trends to determine if corrective actions are needed. Each NCR shall be numbered sequentially and include a brief description and status.

The Contractor shall include in the QMP procedures for controlling the use of Nonconforming Work, including the tagging of Nonconforming Work products. Nonconforming Work product tags shall only be removed by the originator of the NCR or the originator's supervisor, and only when the Contractor demonstrates to CDOT that the Nonconforming Work product meets the requirements of the Contract.

As a part of its Acceptance, CDOT will perform audits, which may result in CDOT-issued NCRs. These efforts do not relieve the Contractor of PC responsibilities. CDOT will forward all audit reports and Nonconformance Notices (NCN) to the Contractor, and the Contractor shall respond to each NCN within 7 Days of issuance. The Contractor's response shall identify how it

proposes to remedy the Nonconforming Work and the date by which the remedy shall be completed. The QMP shall describe the approach and methodology for resolving CDOT NCNs.

3.6.1.7 Corrective and Preventative Action

The QMP shall describe corrective and preventative action procedures that the Contractor shall use to identify and improve processes that produce, or may produce, systemic Nonconforming Work identified by the Contractor or by CDOT. The Contractor's corrective and preventative action procedures shall include:

1. Methods to investigate the cause of systemic Nonconforming Work and to determine what corrective action is needed to prevent recurrence.
2. Methods to analyze all processes, Work operations, quality records, service reports, and CDOT assessments/testing to detect and eliminate the possibility of systemic Nonconforming Work from occurring.
3. Methods to prioritize corrective and preventive action efforts based on the level of risk to the quality of the Work.
4. Controls to ensure that effective corrective and preventative actions are taken when the need is identified.
5. Methods to implement and record changes in procedures resulting from corrective and preventative actions.
6. Procedures to respond to CDOT-issued Corrective Action Requests (CAR).

3.6.2 Operational Quality Control

The Contractor shall establish, document, and implement an Operational Quality Control Plan as part of the CQMP. The Operational Quality Control Plan shall include all procedures necessary for the Contractor to control the quality operations that support the construction of the Project, including:

1. Environmental Compliance Work Plan included in Book 2, Section 5.
2. Maintenance of Traffic operations.
3. Construction water quality.
4. Maintenance during construction.
5. Safety.

3.7 CDOT Owner Acceptance Activities

3.7.1 CDOT Quality Assurance

CDOT will provide the construction acceptance testing and inspections on the Project. Acceptance of Work items for payment shall be based on results from current CDOT testing and inspection procedures. Minimum sampling and testing frequencies of the product will be based on the CDOT *Field Materials Manual* and Book 2, Section 19.

The Contractor shall ensure the compatibility and integration of design, construction,

installation, traffic management, and public information with CDOT's inspection and testing procedures.

Materials accepted on the basis of a COC or CTR may be sampled, inspected, and tested by CDOT at any time.

CDOT's Quality Assurance will assess the Contractor's compliance with the requirements of the Contract Documents.

CDOT will:

1. Perform quality oversight audits and reviews.
2. Monitor and audit the Contractor's quality processes to verify adherence to the QMP.
3. Participate in pre-activity meetings, hold point inspections, on-site meetings, and plan and specification reviews, as deemed necessary by CDOT.
4. Participate in Contractor-initiated training, as deemed necessary by CDOT.
5. Audit the Project records.
6. Conduct verification and testing (oversight, sampling, inspection, and evaluation).
7. Conduct Independent Assurance Testing (IAT).
8. Perform off-site verification inspection and testing of the fabrication of precast and pre-stressed concrete structures and of structural steel.
9. Issue Final Acceptance of the Work.

CDOT retains the right to stop Work if:

1. There is evidence that the QMP procedures are not being followed, or if the design, Materials, or workmanship do not meet the Contract requirements. CDOT may, at its sole discretion, stop Work until corrective procedures have been established and implemented.
2. The Contractor fails to correct conditions that are unsafe, as determined by CDOT, for project personnel and/or the general public.

CDOT reserves the right to:

1. Check testing equipment for compliance with specified standards and to check test procedures and techniques.
2. Access the test facilities of independent testing agencies to witness testing and verify compliance of test procedures, test techniques, tester certifications, and test results.

CDOT has the authority to remove any of the following from the Project:

1. A tester who does not perform tests in accordance with the test methods established in CDOT's *Field Materials Manual.*
2. A tester who does not report test results accurately.

3. An inspector who does not perform duties consistent with industry-accepted standard practices or who demonstrates incongruity with respect to the Contract.
4. An inspector or tester who is not currently certified for the test or inspection being performed.

3.7.2. Independent Assurance Roles and Responsibilities

CDOT will perform independent assurance reviews and IAT to ensure:

1. CDOT and Contractor quality personnel are trained and certified and can demonstrate they understand the test procedures they are performing.
2. The test equipment used by CDOT's and the Contractor's quality personnel is calibrated.
3. Split sample test results correlate.

IAT results also will be used as referee tests to assess statistically significant differences, determined by CDOT in its sole discretion, between Contractor PC Tests and OA results. The results of the IAT shall be documented in the QRD.

3.7.3. Third Party Owner Inspections and Approvals

Third Party personnel have the right to inspect the Work, provided the Third Party has jurisdiction over the Work and as required by Applicable Law. The Contractor shall adhere to Third Party inspection and approval procedures.

3.7.4. Corrective Action Request

CDOT may issue a Corrective Action Request (CAR) to the Contractor if CDOT detects systematic trends in performance in implementation of the Contractor's QMP or other management plans. The Contractor shall provide CDOT with a written response to the CAR for Acceptance within 48 hours of receipt of the request and shall include the following information:

1. Identification of the cause(s) of the performance trend.
2. Recommendation on a proposed action(s) that addresses the cause(s) of the performance trend and prevents future reoccurrence.
3. A method to ensure the proposed action(s) are implemented and were effective in correcting the performance trend.
4. Date when the proposed action will be implemented.

The Contractor shall not implement the proposed action(s) prior to Acceptance of the CAR response by CDOT.

3.8 Final Inspection and Final Acceptance

The Contractor shall include a process within the QMP for scheduling, accomplishing, and tracking the final inspection and final acceptance process for each structure segment and for the Project overall; and for developing and resolving punch lists in conformance with the requirements in Book 1, Section 20. The Contractor shall establish an acceptance task force to implement and monitor the final inspection and final acceptance process. This task force shall include the QCA, DQM, CQM, and CDOT personnel and shall meet prior to each structure segment completion and no later than 6 months prior to the Project Completion Deadline.

CDOT's final inspection will be performed prior to Final Acceptance of the Project in accordance with of Book 1, Section 20.

Contractor quality personnel shall perform an independent Inspection of all Work and address any outstanding and/or Nonconforming Work prior to requesting an Inspection from CDOT. The Contractor shall invite CDOT and other affected Agencies to attend independent inspections of the Work. CDOT will attend at its sole discretion. The punch list and punch list log shall be completed by Contractor quality personnel and shall be provided to CDOT for information.

At the completion of constructed elements of the Work, CDOT and the Contractor quality personnel will conduct a final inspection of the Work and the associated As-Constructed Documents, certifications, and Contractor cleanup requirements. After the joint Inspection, CDOT and the Contractor will agree upon punch list items and an agreed date to complete correction of the items.

CDOT will perform a final field audit of the Work after the Contractor has resolved its final punch list. CDOT final inspection will be performed prior to Final Acceptance of the Project per Book 1, Section 20.

3.9 Deliverable Requirements

3.9.1. Quality Management Plan

The Contractor shall submit the QMP as required in Section 3.1.

Field Code Changed

3.9.2. Design Deliverables

The Contractor shall submit all design deliverables to CDOT for Review, Acceptance, or Approval including the QMP, Work plans, design reports and studies, Preliminary Design Plans, RFC Documents, NDC and FDC documents, Final Design Documents, and As-Constructed Documents. The design deliverables shall be submitted to CDOT as defined in Section 3.5, unless otherwise specified in the Contract Documents. The design Acceptance process shall include a comment resolution process for documenting all comments and their resolution. The DQM shall ensure all comments have been resolved prior to final submittal of all documents that require CDOT's Acceptance or Approval.

The Contractor shall identify on its Contract Schedules when design deliverables will be submitted to CDOT.

The Contractor shall provide CDOT one set of electronic files of the design deliverables. All deliverables shall be submitted in their native format and *.PDF format.

As-Constructed Documents shall show all changes. All changes shall be noted using CADD. Hand-drawn changes will not be allowed.

The design deliverables shall be delivered to CDOT indexed and clearly marked to indicate the date of issue and stage of development. All design deliverables shall include a title block, consistent with the standard project drawing format established as part of the QMP, with the following information:

1. Date of issuance and including all prior revision dates.

2. Contract title and number.
3. Subject identification by Contractor drawing or Contract reference.

All RFC Documents and NDC and FDC documents shall be sealed by the Engineer(s) in responsible charge. If a design deliverable requires review and approval from a Third Party or permitting authority, the Contractor shall gain such concurrence prior to submitting the design deliverable to CDOT.

Specifications applicable to a design deliverable shall be submitted with the design deliverable. The CADD drawings and associated documents shall be organized in a logical manner, have a uniform and consistent appearance, and clearly depict the intent of the design and construction. In addition:

1. The software requirements for all submitted design deliverables shall be Bentley OpenRoads Designer or compatible format, in accordance with the current CDOT standards in effect at the time of Proposal submittal by the Contractor.
2. All design deliverables shall be in English units. The Project coordinate system shall comply with the CDOT *Survey Manual*.
3. The Contractor shall prepare RFC, NDC, and FDC documents, and As-Constructed Documents that shall include, as applicable, the following:
   A. Title Sheet
   B. Index
   C. Standard Plan List
   D. Summary of Approximate Quantities
   E. Roadway Design Data
   F. General Notes
   G. Pavement Details
   H. Roadway Details
   I. Drainage Details
   J. Geotechnical Plans
   K. Environmental Mitigation, as necessary
   L. Permanent Signing Plans
   M. Aesthetic Elements
   N. Roadway Typical Sections
   O. Roadway Geometric Layout Plans
   P. Roadway Geometric Layout Tables
   Q. Roadway Plan
   R. Roadway Profile
   S. Construction and Phasing and Traffic Control Plans

T. Intersection Plans

U. Pavement Plans

V. Drainage Plans

W. Pavement Marking Plans

X. Utility Plans

Y. Landscape/Seeding Plans

Z. Grading Plans

AA. Bridge Plans

BB. Wall Plans

CC. Stormwater Management Plans

DD. Right-of-Way Plans

EE. Survey Documentation Plans, as needed

FF. Other Details, as needed

GG. Specifications

The Contractor shall provide one set each of electronic files on compatible electronic media of Utility As- Constructed Documents to CDOT and to the respective Utility Owner(s) for Utility Work constructed by the Contractor, that conform to the CDOT *CADD Manual* (as listed in Book 3), except as modified by the specific requirements of the individual Utility Owners. The Contractor shall obtain from each Utility Owner, performing its own construction, 1 set of Utility As-Constructed Documents for its Utility Work and shall show the information on the As-Constructed Documents.

All CADD files shall be documented in a tabular format describing the path, file name, and description.

3.9.3. Document and Data Approval

The Contractor shall ensure all deliverables include a signed and dated certification by the originator of the deliverables and the deliverable is complete and meets the requirements of the Contract.

3.9.4. Document and Data Changes

The Contractor shall ensure any changes to deliverables provided to CDOT, as revised, are in a format that can enable changes to be readily apparent and trackable (e.g., documents use the redline/strikeout method).

3.9.5. Product Data

The Contractor shall submit to CDOT for Acceptance all manufacturers' warranties, guarantees, instruction sheets, parts lists, and other product data within 20 Days of installation of the items to which they relate. The Contractor shall ensure the product data cited is organized and indexed in a manner that allows easy retrieval of information.

3.9.6. Deliverables

The Contractor shall submit the following to CDOT for Review, Acceptance, or Approval:

Table 3-1 Deliverables

Deliverable	Review, Acceptance, or Approval	Schedule
Quality Management Plan	Approval	For design-related (DQMP) Work, prior to issuance of NTP1 For construction-related (CQMP) Work, prior to issuance of NTP2 For all Work (entire QMP) prior to issuance of NTP2
All quality documentation	Acceptance	Prior to Project Completion
Quality Status Report	Review	Concurrent with each Monthly Invoice
Summary of Activity-Specific Materials Quantities, to Support the MTIP	Acceptance	Monthly on Form 250 with Quality Status Report
Proposal level plans	Review	Address proposal level comments prior to NTP2 (comments on Volume IV Proposal Plans will be provided to the selected Proposer prior to NTP1)
Preliminary Design Plans (30% design completion)	Review	Prior to submittal of Pre-RFC documents (100%) and a minimum of 14 Days, excluding Holidays, prior to the review meeting
Pre-RFC Documents (100%)	Review	Prior to submittal of Final RFC Documents and a minimum of 14 Days, excluding Holidays, prior to the review meeting
Final RFC Documents	Acceptance	A minimum of 10 Days prior to construction of the applicable Work
Notice of Design Changes and Field Design Changes documents	Acceptance	Prior to construction of the revised Work
Final Design Documents	Acceptance	After the completion of all design
As-Constructed Documents	Acceptance	Prior to Segment Acceptance of the Work
Task force meetings action/decision log	Review	3 Days after meeting
Design milestone review meeting action/decision log	Review	7 Days after meeting
Contractor Inspections, Test data, and Test results	Review	Within 48 hours following Inspection and/or Test

Deliverable	Review, Acceptance, or Approval	Schedule
Certificates of Compliance (COC) or Certified Test Reports (CTR) documents	Acceptance	Prior to Segment Acceptance
Safety Critical Construction Plan	Review	2 weeks prior to the safety critical element conference per Book 2, Section
Nonconformance Reports and Work log	Acceptance	Weekly
Written response to Corrective Action Requests (CAR)	Acceptance	Within 48 hours of receipt of the request
Copies of all manufacturers' warranties, guarantees, instruction sheets, parts lists, and other product data	Acceptance	Within 20 Days of installation of the items to which they relate
Final Materials documentation and CDOT Form 250 Materials documentation Record	Acceptance	Prior to Final Acceptance