

3.0 QUALITY MANAGEMENT

The Contractor shall be responsible for all Design Quality Control and Design Quality Assurance and Construction Quality Control activities for the Project. CDOT will perform Construction Quality Assurance and Verification, either by testing or assessment, for conformance to requirements of the Contract. The Contractor shall develop a Quality Management Plan (QMP) that documents the Contractor's commitment to quality and all quality requirements of the Contract. The QMP shall include the Contractor's quality policy and approach for Quality Control, Design Quality Assurance, quality improvement, assignment of quality personnel and resources, and training of the associated Quality Management Systems (QMSs).

The QMP shall describe, in detail, the Quality processes related to including internal checks, reviews, audits, responsibility and authority, and resolutions to occurrences of non-conformance to Contract requirements. The QMP shall address the responsibility and Approval authority of CDOT and outline processes for addressing issues related to elements of Work that do not comply with the Contract.

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

3.1 Administrative Requirements

The Contractor shall submit the QMP for design related Work to CDOT (and other activities that that Contractor is performing prior to NPT 2) for Approval prior to issuance of NTP1. CDOT will deliver its Approval or disapproval and provide comments on the initial QMP submission within 10 Working Days following CDOT's receipt of the QMP. The Contractor shall revise its QMP within seven Working Days upon notification by CDOT of disapproval and comments.

The entire QMP for all of the Work on the Project must have CDOT's Approval before NTP2 will be issued. CDOT will deliver its Approval or disapproval and provide comments on full QMP submission within 15 Working Days following CDOT's receipt of the QMP. The Contractor shall revise its QMP within 10 Working Days upon notification by CDOT of disapproval and comments.

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 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 that its policy is implemented at all levels of the 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. The statement shall explain the Contractor's commitment to quality and the responsibility the Contractor has for assuring 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 activities, at a minimum, in its quality planning efforts to ensure continued conformance to Contract requirements:

1. Identify the necessary processes, resources, and Quality Assurance personnel that are needed to assure 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 Quality Control, Quality Assurance, 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 Assurance (auditing) to ensure the Contractor employees, Subconsultants, Subcontractors, and Suppliers understand and are effectively implementing the QMP. The Contractor, as a minimum, shall audit their 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 Quality Program. The Contractor shall identify and implement processes and procedures that foster communication with CDOT and all stakeholders of the Project.

3.2 General Roles and Responsibilities

3.2.1 Contractor Roles and Responsibilities

The Contractor shall be responsible to establish, document, and implement a Quality Control Plan. The Quality Control 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's Quality Control Plan shall include a testing and inspection schedule to control the production processes.

The Contractor will 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 that the design meets the requirements of the Contract.

The Contractor shall notify CDOT a minimum of 24 hours in advance of all Quality Assurance testing needs for the project.

3.2.2 CDOT Roles and Responsibilities

CDOT will provide a qualified Construction Quality Assurance team to perform Quality Assurance (QA) auditing and acceptance testing. The QA staff shall remain independent from the Contractor's production and Quality Control (QC)... The CDOT construction QA Team will perform on-site inspection and testing of the construction elements of the Work to verify that all Work has been constructed in conformance with the Contract requirements.

CDOT will perform Owner Verification using a sampling approach to assess the Contractor's compliance with the requirements of the Contract Documents. CDOT reviews of sampled Work for Contract compliance are defined as Verification reviews.

CDOT will perform independent assurance reviews and tests to ensure that the Contractor's Quality personnel are trained and certified and demonstrate that they understand the inspection and test procedures they are performing, and to ensure that the test equipment used by the Contractor's Quality Control/Assurance personnel is calibrated.

3.3 Personnel Requirements

The Contractor shall include in the QMP an organizational chart that illustrates a commitment to an effective quality program to ensure all Work meets the requirements of the 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 that responsibilities and authority are defined and communicated within their organization. The Contractor shall identify a Quality Manager (QM) that reports directly to executive management and shall be responsible for all Contractor design and construction quality activities for the Project. The Quality Manager cannot be responsible for the management and direction of Quality Control activities.

3.3.1 Contractor's Quality Team Key Personnel

Quality-related Key Personnel are the design-build Quality Manager (QM), (Design Quality Manager DQM), and the Construction Quality Manager (CQM). The QMP shall identify the persons who will fill these Quality-related Key Personnel roles. The QM and CQM shall be co-located at the Project offices.

The QA Team shall not replace any Quality Key Personnel without prior Approval from CDOT. Personnel replacements must have equal or better qualifications as determined by CDOT.

1. Quality Manager (QM)

The QM shall be responsible for certifying the overall Quality of the Project, including design, construction, management, and administrative processes, and for providing evidence of compliance to the Contract requirements. The QM shall report directly to an executive management committee including representation from the leadership of CDOT and the Contractors team. At a minimum, the Quality Control manager shall provide monthly status reports of the Project's quality to CDOT.

A request to replace the QM shall name a proposed replacement manager and their qualifications. The proposed replacement must be on-site within 15 Working Days of CDOT Approval of the change. The QM shall not have any other project responsibilities. The QM shall be a registered Professional Engineer in the State of Colorado.

2. Design Quality Manager (DQM)

The DQM shall report directly to the QM and shall be responsible for verifying the quality of the design elements of the Project.

3. Construction Quality Manager (CQM)

The CQM shall report directly to the QM and shall be responsible for verifying the quality of the construction elements of the Project.

3.3.2 ~~Contractor's Design Support for CDOT Quality Assurance Team~~ Reserved

3.3.3 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 specific 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 that they achieve and maintain reasonable proficiency.
3. Ensure that 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 Verification efforts to ensure it understands its roles and responsibilities for cooperating and responding to CDOT Verification activities.

Training efforts shall precede the associated Work.

3.4 Documentation

3.4.1 Documentation Control

The Contractor will provide a web-based portal (Portal) to facilitate electronic submission of documentation to CDOT.

The Contractor shall establish and maintain a document control system (DCS) for meeting documentation requirements for the filing of design criteria, reports and notes, calculations, plans, specifications, schematics, project administration, supporting materials, etc. and for the specific responsibilities of personnel to satisfy these requirements. All documents required by the Contract to be submitted to CDOT by the Contractor are required to be organized, indexed, transmitted to, and maintained in the Portal throughout the duration of the Project.

All documentation submitted to the Portal shall be properly attributed to allow for future retrieval within the system. File naming conventions and other attributes shall be developed with the intent of allowing for and contributing to easy access and retrieval of any and all documents related to any item(s) of the Work including the ability to allow for cross discipline queries within the Portal.

The DCS will identify (by name) the document control supervisory personnel for the maintenance and management of records and documents pertinent to the Contractor and Department activities.

The records shall include factual evidence that required inspections or tests have been performed, including type and number of inspections or tests involved; results of inspections or tests; nature of Nonconforming Work and causes for rejection, etc.; proposed remedial action; and corrective actions taken. The records shall cover both conforming and nonconforming Work, and shall include statements that all supplies and materials incorporated in the Work are in full compliance with the Contract Documents.

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

The records shall include a master list of approved design submittals, revisions and field design changes. The QMP shall include a process to communicate design changes to the construction Site on a timely basis consistent with the progress of construction activities.

3.4.2 Request for Information

The QMP shall define a system to control the Request for Information (RFI) process for both Design-Builder and Third Party generated issues, and identify who is required to respond to

the RFI. CDOT will be included in the distribution of all RFIs. The QA Team shall obtain Department concurrence prior to formally issuing a RFI response to the Contractor.

3.4.3 Design Review Documentation

The QMP shall outline a process to maintain a written record of all design reviews.

The written record:

- Lists the participants in each review or visit
- Includes meeting agendas and minutes
- Reports all items discussed
- Identifies discrepancies noted and reports on corrective action(s) taken or planned
- Identifies follow-up action items, due dates, and the responsible party
- Identifies items needing resolution and time constraints for resolution

Provide reports of design reviews and comment resolution processes within two Working Days of the completion of the review.

3.4.34 Quality Reporting

The QMP shall outline a reporting process for recording, organizing, and distributing a record of internal Quality activities. Quality reports shall be distributed to the Contractor's and CDOT's management personnel. The reports shall be prepared and submitted monthly. 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 FDCs
4. A summary of the status of all non-conformances
5. A summary of any corrective and preventative actions

3.5 Design Quality

The QMP shall 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 QMP 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 assure that the design meets the requirements of the Contract
4. Identify and track Design Document deliverables.

5. Provide for the Approval, tracking and recording 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 Documents

3.5.1 Preliminary Design Plans

The Contractor shall prepare Preliminary Plans (at approximately 30% design completion) showing how the Contractor's design meets the Basic Configuration requirements and submit to CDOT for Acceptance. The Preliminary Plans shall include a cover sheet, typical sections, highway ramp and street plans and profiles, bridge and major drainage structures general layouts, master drainage plan, preliminary retaining wall layouts and roadway cross sections at 200 foot intervals.

3.5.2 Released For Construction (RFC) Documents

Released for Construction Documents allow the Contractor to initiate construction in advance of Acceptance of the final Design Documents by CDOT. The RFC Documents shall include a Materials Testing and Inspection Plan (MTIP). This plan will give testing quantities and frequencies, and Quality Assurance inspection hold points. The Contractor's Quality Manager shall approve RFC Documents prior to release for construction.

The QMP will identify the procedure for which RFC documents are released for construction. Include a discussion of the specific roles of the Contractor's Project Manager, DQM, CQM, and Design Manager.

The QMP shall identify a specific process to provide for the review of the RFC documents by CDOT and any other agencies that will ultimately have Acceptance or Approval authority for the work and the Final Design Documents. The review process will include a comment resolution process for documenting all review comments and their resolution prior to release of RFC documents for construction. The DQM shall provide assurance that all comments have been resolved prior to release of the RFC documents for construction. CDOT's review of the RFC documents will not be considered as an approval of any elements of the RFC documents that do not conform to the Contract Requirements.

The QMP shall include a process for a Colorado registered Professional Engineer(s) in responsible charge for the design to review and approve all RFC Documents and revisions to Released for Construction Documents.

3.5.3 Design Changes after Plans have been Released for Construction

In the QMP, outline the design, review, and approval method for issuing Notice of Design Changes (NDC) and/or Field ~~De~~esign Changes (FDC) after plans have been released for Construction. Design changes are new items of work that were not included in the review packages. New items must go through a design review process even if they appear on existing plan sheets. All NDCs and FDCs shall be Approved by the Engineer(s) in Responsible charge of the original design(s).

In the QMP, include a process to propose, notify, receive, track, respond to, and distribute design changes, and to identify the general goal, the participants and their associated responsibilities, and a work process for each change. The QA Team shall review all design changes. CDOT shall be invited to all reviews. The QA Team, in coordination with CDOT, will jointly determine the procedures and timing of reviews, with the mutual understanding that a timely and expeditious design change process may benefit all parties, balanced with the quality of the end product.

3.5.4 Working Shop and Falsework Drawings

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

- Personnel assigned to perform construction submittal reviews
- Procedures for documenting reviews and approvals and for obtaining corrective action

3.5.5 Final Design Documents

The Contractor shall submit final Design Documents to CDOT for Acceptance. CDOT shall not Accept the final Design Documents until the Contractor has completed all design and has addressed, resolved, and incorporated, to the satisfaction of CDOT, any prior Contractor or CDOT Acceptance review comments. The Contractor shall ensure and provide documentation to CDOT that all review comments have been addressed. If deemed necessary by CDOT, the Contractor shall resubmit revised final Design Documents until such time that CDOT determines that the review comments have been satisfactorily addressed. The final Design Documents submittal shall include, as a minimum:

1. All design plans.
2. Design calculations.
3. Design reports.
4. Specifications.
5. Estimated quantities.
6. Electronic CADD files as specified elsewhere in the Contract Documents.

3.5.6 As-Built Documents

As-Built Documents shall be submitted to CDOT for Acceptance. CDOT may assess As-Built Documents to ensure completeness and compliance with the requirements of the Contract. CDOT shall not Accept As-Built Documents until the Contractor has adequately addressed any prior Contractor QC reviews, QA audits or CDOT assessments/testing. The Contractor shall ensure and provide documentation to CDOT that all have been addressed. The As-Built Documents submittal shall include:

1. All plans reflecting Released for Construction Documents or any revisions to Released for Construction Documents
2. Resolution of prior Contractor QC reviews, QA audits or CDOT assessments/testing

3. Design calculations
4. Design reports
5. Specifications
6. Electronic CADD files, as specified elsewhere in the Contract [Documents](#)

3.5.7 Design Coordination

The QMP shall describe how the design team schedules the design efforts, including task force meetings, design reviews, constructability reviews, design meetings, independent design checks, and a schedule for Released for Construction and As-Built Documents.

The Contractor's Designer shall conduct weekly task force meetings to coordinate the design development within the Contractor's organizations, CDOT and other affected agencies. As 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 take meeting minutes for all task force meetings and provide minutes to CDOT within 5 Working Days after each meeting.

The Contractor shall hold joint design milestone review meetings for the Preliminary Design Plans, RFC Documents, NDC Plans, Final Design Plans 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 submit relevant plans, specifications, reports and design documents to CDOT for review a minimum of 5 working days prior to the meetings.](#) The meetings minutes shall be taken by the Contractor and submitted to CDOT within five Working 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 two months in advance of review meetings. Milestone review meetings will not be scheduled within intervals of less than five working days, unless otherwise Approved by CDOT.

3.6 Construction

The Contractor shall be responsible for performing and documenting all required construction Quality Control activities necessary to control the Work. The QMP shall extend to both permanent and temporary Work (erosion control, traffic control, etc.). The QMP shall describe specific procedures to be followed to provide assurance that all the 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 being incorporated in the Project will perform satisfactorily for the purpose intended. The QMP will specifically include the procedures for Quality Control inspecting, sampling, testing, checking, and documenting the Work including all Work performed by Subcontractors, and for distribution of information (e.g. Released for Construction Plans, design changes, Non-conformance Report (NCR) remediation, etc.) to all necessary parties.

3.6.1 Construction Quality Control

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The Contractor shall be responsible to establish, document, and implement a Quality Control Plan. The Quality Control 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 testing and inspection schedule to control the production processes.

Tests or inspections performed by production personnel shall not be used to satisfy the Quality Assurance (Auditing and Acceptance) requirements. All QC personnel shall be capable of performing all tests (both in the field and in the lab), have the necessary personnel to respond to the workload, and provide the equipment/facilities to perform all tests. All testing personnel need to be properly certified and the QC labs need to be certified and on the AMRL accredited list.

QC staff shall:

- Be responsible for Quality of the Work during production.
- Be independent of the QA staff.
- Have authority to stop Work.

The QMP shall include QC checklists. The QC checklists shall be developed and maintained by the Contractor at the Project Site and organized for execution of Work Breakdown Structure Activities and all other associated Contract requirements. The QC checklists shall be available for CDOT personnel review at all times. Unmaintained or not up-to-date QC checklists will constitute immediate Nonconforming Work. Work shall not proceed until the QC checklist is updated and made compliant to the requirements herein. The Contractor shall use current CDOT forms, manuals and handbooks to develop QC checklists.

3.6.1.1 Materials Testing & Inspection Plan (MTIP)

The Contractor shall prepare and implement a Materials Testing & Inspection Plan (MTIP) as part of the Approved QMP that includes the appropriate criteria, tests, and inspection requirements identified in CDOT's Construction Manual, Field Materials Manual, and Standard Specifications. The MTIP shall include Contractor-developed inspection checklists of requirements as set forth herein.

The MTIP shall identify all Quality Control 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 Quality Control processes. Where no inspections or test standard exists in any of the CDOT manuals, the MTIP shall develop criteria based upon the best-available industry standard information and technology.

The MTIP shall include processes to control, calibrate, and maintain test equipment (both field and lab equipment), to ensure it meets industry standards and other applicable requirements. Test equipment used by the Contractor shall be of a quality and capacity that ensures that measurements made are to levels of accuracy and precision that are required by the test procedure.

The MTIP shall include procedures for delivery, handling, and storage of furnished products ensuring they are properly handled and stored to prevent damage, deterioration, or theft.

The MTIP will include the following elements:

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1. Inspection: The MTIP that shall include detailed inspection procedures to be used in cases where inspections are to serve as the basis for verifying compliance with the requirements of the Contract. The Contractor shall conduct each inspection in accordance with the Approved QMP. The Contractor shall document whether the inspections 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 etc.). The Contractor shall include failing inspection results, when applicable, in the inspection documentation.
2. Testing: At a minimum, the Contractor shall follow the CDOT Field Materials Manual and its Frequency Guide Schedule for Minimum Materials Sampling, Testing, and Inspection requirements identified under the column titled “Project Verification Sampling & Testing Frequency” for all Quality Assurance tests required and recorded on the associated CDOT standard forms.

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 tests results in the test documentation.

Independent Laboratories shall submit signed and certified test reports to the Contractor not more than 14 Working Days after completion of the tests for all tests which require an independent Laboratory.

CDOT may witness any test conducted for Independent Assurance purposes. The Contractor shall develop and maintain a current Test log for all tests required by the Contract.

As a minimum, the Contractor shall document results of tests in report format. Include the following:

- Contract or project identification number
- Identification of items tested
- Quantity
- Date and time test conducted
- Location of items tested
- Test procedure used
- Name of technician
- Acceptance criteria
- Results - acceptance or rejection
- Authorized signature

The Contractor shall provide both a materials testing field laboratory (Class 2) for the MTT's and a certified full service geotechnical laboratory for more specialized testing if required that has been pre-certified by CDOT. Laboratories performing acceptance testing shall be independent from the QC laboratories.

3.6.1.2 Certificates of Compliance (COCs) / Certified Testing Results (CTRs)

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The Contractor shall include in the QMP a method of handling and documenting Work and products accepted in the Work by COC or CTR. The Contractor shall obtain COCs / CTRs prior to incorporation in the Work and before inclusion on the monthly invoice, and maintain a complete log of all COCs and CTRs. The log and all COCs / CTRs shall be available for CDOT's Verification at any time. The Contractor shall include in the COC/CTR log, signed certification that all Materials represented by each COC/CTR was installed in the Work. Certification shall be according to requirements of the Contract. The Contractor shall submit all COCs/CTR to CDOT prior to Final Acceptance.

3.6.1.3 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, QC, and CDOT QA staff, determine the conformance of the Work to that point. CDOT shall be invited to all Hold Points, with notice of each Hold Point provided 24 hours in advance.

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, and CDOT QA staff have formally authorized the continuance of the Work.

Following are the minimum Hold Points that shall be established:

Environmental Mitigative Measures

- A. Before any construction occurs, and after implementation of Best Management Practices (BMPs) and environmental controls per the Permitting requirement
- B. Prior to disturbing any stream, dewatering, diverting watercourses, or building cofferdams

Embankments

- A. After completion of drainage and utility installations, and before backfill
- B. After all clearing, grubbing, and excavation
- C. After each lift in accordance with specifications for lift requirements (applicable to all embankments, including walls)
- D. After completion of MSE wall panel placement every 10 vertical feet
- E. At completion of embankment placement
- F. At completion of surcharge placement
- G. Prior to removal of surcharge

Structures

- A. Before placement of the leveling pad of an MSE wall or other type of retaining wall
- B. At completion of bridge embankment settlement
- C. Before start of bridge foundation pile-driving
- D. At Contractor's QA approval of pile driving submittals (including design calculations, wave analysis, and hammer specification)
- E. After completion of pile-driving at each structure support (pile group), including pile-driving results and records

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- F. Before concrete placement of any substructure element, including pile infilling and drilled shafts
- G. Before and after girder and diaphragm placement
- H. Before concrete placement of deck, approach slabs, diaphragms, and parapets
- I. Before concrete placement of cast-in-place (CIP) retaining walls and box culverts; after rebar placement but before final form placement for CIP retaining walls and box culverts taller than 6 feet

Surfacing, Paving, and Concrete

- A. Before placement of each course above sub-grade on permanent roadway components (granular borrow, lean base, etc.)
- B. Before placement of each lift of asphalt or PCC paving on permanent roadway components
- C. Before any placement of concrete
- D. Every 1,000 feet of slip-form barrier

Traffic Devices and Switches

- A. Before opening to traffic

ATMS

- A. Before backfilling trenches containing conduit
- B. Before placing flowable fill around junction boxes

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 and/or the Contractor may identify additional Hold Points to be included at any time throughout the Project. CDOT and the QA Team will coordinate to define the procedures and criteria for additional Hold Points. The QMP shall include any additional Hold Points identified and necessitated by the Contractor's specific design and construction approaches.

3.6.12.45 **Specific Inspection Procedures**

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.

Reinforcing Steel Placement

The QMP shall detail the Contractor's approach to verifying proper placement of tiebars and dowel bars in PCCP through destructive and/or non-destructive methods.

3.6.1.54 **Specialized Manufacturing Facilities**

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

- How manufacturing facilities will be selected.
- How the Contractor and the CDOT QA Team will determine the inspection requirements of the facility (i.e. initial capabilities of the facility, ongoing process and production, final product certification and documentation, delivery and handling processes etc.).
- The lead times required for on-site inspection of the facilities. CDOT requires a 30-day lead time to make travel arrangements for facility capability inspection.
- Sampling and testing requirements of final product.

3.6.2. Nonconforming Work

The Contractor shall coordinate with CDOT Quality Assurance 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 CDOT. 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 for the disposition of Nonconforming Work shall be established in the QMP. Nonconforming Work shall be identified by completing a Nonconformance Report (NCR). A NCR shall include:

1. Identification of Nonconforming Work, including tagging Work products
2. Evaluation of the Nonconforming Work
3. Recommendation for "repair" or "use as is" dispositions
4. Cause of Nonconforming Work
5. Proposed corrective action to prevent recurrence
6. Responsibility for accomplishing corrective action
7. Schedule of Work with a date of remedy completion
8. Signature lines for the Engineer in Responsible Charge, Quality Manager and CDOT verifying that the Nonconforming Work recommended remedy has been approved.

The recommended remedy for the Nonconforming Work shall be approved by the Engineer in Responsible Charge and the Quality Manager prior to its submittal to CDOT. The Contractor shall not perform the recommended remedy prior to its submittal to CDOT for "repair" and "use as is" dispositions.

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 and shall be used by the Contractor to look for Nonconforming work trends to determine if corrective actions are needed.

All NCRs shall be recorded by the Contractor and provided to CDOT.

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.

All NCRs shall be recorded by the Contractor and provided to CDOT. The Quality Manager will maintain a log of all NCRs and submit it weekly to CDOT. Each NCR shall be numbered sequentially and provide a brief description and status.

3.6.3 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 upon 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

3.7 CDOT Owner Quality Assurance and Verification Reviews

3.7.1 CDOT Quality Assurance

CDOT will provide the construction acceptance testing and inspections on the Project. All payments for items accepted on the Project shall be based on 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 20 - Project Special Provisions in effect at the time of Final Request for Proposals (RFP).

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 Certificate of Compliance (COC) or Certified Test Result (CTR) may be sampled, inspected, and tested by CDOT at any time.

Within thirty (30) Days of the completion of the Work, the Contractor shall furnish CDOT with a completed CDOT Form #250 – Materials Documentation Record, listing items utilized to construct the Project and the approximate quantity of each item, for Acceptance.

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

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CDOT will:

- Perform Quality Assurance audits and reviews
- Monitor and audit the Contractor's Quality Program processes to verify adherence to the QMP
- Participate in pre-activity meetings, Hold Point inspections, on-site meetings, and plan and specification reviews
- Participate in Contractor initiated training
- Audit the Project records
- Conduct acceptance testing and inspection
- Perform off-site verification inspection and testing of the fabrication of precast and pre-stressed concrete structures and of structural steel
- Issue Final Acceptance of the Work

CDOT retains the right to stop Work:

- If there is evidence that the QMP procedures are not being followed, or if the design, materials, or workmanship are not meeting the Contract requirements, CDOT may, at its sole discretion, stop Work until corrective procedures have been established and implemented.
- If the Contractor fails to correct conditions that are unsafe for Project personnel and/or the general public.

CDOT reserves the right to:

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

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

- A tester who does not perform testing in accordance with the test methods
- A tester who does not report test results accurately
- An inspector who does not exercise good judgment in the performance of duty or demonstrates incongruity with respect to the contract
- A tester who is not certified

3.7.1 Contractor Design Support for CDOT Quality Assurance

The Contractor shall provide its designer to support CDOT Quality Assurance Activities, as follows:

1. The Contractor's Design Manager shall participate in weekly status meeting throughout the duration of the construction.
2. The Contractor's Design Manager will be available for an average two site visits per month at the request of the CDOT Quality Assurance Manager.

3. The Contractor's discipline engineers in responsible charge shall be available for an average of 1 site visit per month at the request of the CDOT Quality Assurance Manager.
4. In addition to the previously noted requirements, the Contractor's Design Manager and, or discipline engineers in responsible charge will be available to assist in identifying and resolving non-conformances that do not meet the design requirements of the Project.

3.7.2 Owner Verification Testing

CDOT, or its representative, will perform Owner Verification Testing (OVT). OVT encompasses material sampling and testing, the results of which are used to validate the QA TEAM's testing efforts. The OVT tests will be conducted at approximately 10 percent of the frequency of the QA testing performed by the QA TEAM. Based on a successful verification by the OVT effort, the QA tests will be incorporated into the acceptance decision. The verification evaluation may include statistical comparison and validation of test results (e.g., F&T test, control charts, etc.), monitoring quality processes of the Contractor's QA Team, and limited over-the-shoulder review of test procedures and processes where appropriate.

3.7.3 Independent Assurance Roles and Responsibilities

CDOT will perform independent assurance reviews and tests to ensure that:

1. Contractor Quality Control/Assurance personnel are trained and certified and demonstrate that they understand the test procedures they are performing.
2. The test equipment used by the Contractor's Quality Control/Assurance personnel is calibrated.
3. Split sample test results correlate.
4. The facilities used are AMRL certified

Independent assurance test results will also be used as referee tests to assess statistically significant differences, determined by CDOT in its sole discretion, between Contractor Quality Control/Assurance tests and CDOT Verification test results.

3.7.4 Third Party Owner Inspections and Approvals

Third party personnel shall have the right to inspect the Work, provided that the third party has jurisdiction over the Work and as required by Applicable Law.

3.8 Final Inspection

At the completion of constructed elements of the Work, the CDOT QA Team will jointly conduct a final inspection with CDOT and the Contractor. The Contractor shall develop a process, within the QMP, for scheduling, accomplishing, and tracking the inspection process and developing punch-lists. Final inspection will include inspection of the Work and associated As-Built documents, certifications, and Contractor cleanup requirements.

During the inspection the CDOT QA Team and Contractor will jointly agree upon punch-list items and an agreed date of correction of the items. The Punch List and Punch List log shall be

completed by Quality Control and Quality Assurance personnel. CDOT, including CDOT Maintenance, and other affected agencies shall be invited by the Contractor to attend walks of the Work to include items on the Punch List.

3.9 Environmental Monitoring and Compliance

The QMP shall describe the methods, processes, and procedures to provide for the effective implementation and documentation of the environmental protection, training, compliance, and monitoring program. Refer to Section 5, Environmental Requirements for additional requirements.

3.10 Deliverable Requirements

3.10.1 Quality Management Plan

The Contractor shall submit the QMP as identified in Section 3.1, Administrative Requirements.

3.10.2 Design Deliverables

The Contractor shall submit to CDOT all milestone review documents, Released for Construction (RFC) Documents, Notice of Design Change (NDC) and Field Design Change (FDC) and As-Built Documents.

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

The Contractor shall provide two hard copies (11 x17 inches for plans, 8.5 x 11 inches for specifications), and one set of electronic files on CD-Rom of the design deliverables to CDOT.

As-Built 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, NDC and FDC documents shall be sealed by the Engineer (s) in Responsible Charge,

If a design deliverable requires review approval from a Local Agency 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.

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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 InRoads/Microstation, in accordance with the current CDOT standards in effect at the time of Proposal submittal by the Contractor. Project files shall be organized and submitted in accordance with CDOT's ProjectWise format.
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 FDC and As-Built Documents for the Project that shall include as applicable the following: following:
 - 1) Title Sheet
 - 2) Index
 - 3) Standard Plan List
 - 4) Roadway Design Data
 - 5) General Notes
 - 6) Pavement Details
 - 7) Roadway Details
 - 8) Drainage Details
 - 9) Geotechnical Plans
 - 10) Environmental Mitigation, as necessary
 - 11) Permanent Signing Plans
 - 12) Traffic Signal Plans
 - 13) Aesthetic Elements
 - 14) Roadway Typical Sections
 - 15) Roadway Geometric Layout Plans
 - 16) Roadway Geometric Layout Tables
 - 17) Roadway Plan
 - 18) Roadway Profile
 - 19) Construction and Phasing and Traffic Control Plans
 - 20) Intersection Plans
 - 21) Bike Path Plan and Profile
 - 22) Pavement Plans
 - 23) Drainage Plans
 - 24) Pavement Marking Plans
 - 25) Utility Plans
 - 26) ITS Plans
 - 27) Landscape/Seeding Plans
 - 28) Grading Plans
 - 29) Lighting Plans
 - 30) Bridge Plans
 - 31) Wall Plans
 - 32) Park Plans
 - 33) Other Details, as needed
 - 34) Specifications

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The Contractor shall provide one set each of electronic files on CD-Rom of Utility As-Built Documents to CDOT and to the respective Utility Owner(s) for Utility Work constructed by the Contractor, that conform to the project CADD requirements, except as modified by the specific requirements of the individual Utility Owners. The Contractor shall obtain from each Utility Owner performing its own construction; one set of Utility As-Built Documents for their Utility Work and shall show the information on the As-Built Documents.

All As-Built Documents electronic files shall be submitted in *.dgn and *.pdf format.

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

3.10.3 Document and Data Approval

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

3.10.4 Document and Data Changes

The Contractor shall ensure that 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).

3.10.5 Product Data

The Contractor shall submit to CDOT for Acceptance two hard copies of 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 that the product data cited is organized and indexed in a manner that allows easy retrieval of information.

3.11 Deliverables

At a minimum, the Contractor shall submit the following to CDOT for review, Approval, and/or Acceptance:

Deliverable	Review, Acceptance, or Approval	Schedule
Quality Management Plan	Approval	For design related Work, prior to issuance of NTP1. The entire QMP for all remaining Work on the Project must have CDOT's Approval before NTP2
Quality Management Plan Revisions	Approval	Prior to release
Meeting Minutes (defined in QMP)	Acceptance	5 Working Days after meeting
Task Force Meeting Minutes	Acceptance	2 Working Days after meeting
Design Progress Meeting Minutes	Acceptance	2 Working Days after meeting
Released for Construction (RFC) Documents	Acceptance	As defined in Contract Schedules
Revisions to Release for Construction Documents	Acceptance	As defined in the Contract
As-Built Documents	Acceptance	As defined in the Contract
Utility As-Built Documents	Acceptance	Within (90) Days after Utility Owner Acceptance
Two hard 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
COC/CTR Record	Acceptance	Prior to Final Acceptance
Final Materials Documentation and CDOT Form 250 Materials Documentation Record	Acceptance	Prior to Final Acceptance