

Section 3 – Quality Management

Administrative Requirements

The Contractor shall be responsible to develop, document, establish, and implement a Quality Control Document (QCD) for the project. Before any Release for Construction Documents (RFC) are issued, and within fifteen (15) Days following Notice to Proceed, the Contractor shall submit the QCD to CDOT for Approval. The Contractor shall implement the Approved QCD prior to performing any Project activities. Any CDOT directed revisions to the QCD prior to Approval shall be made within three (3) Days.

Quality Control Document Requirements

The Contractor shall develop a Quality Control Document (QCD) to illustrate the Contractor's quality process and provide any supplemental descriptions needed to clarify the Contractor's quality process. This shall include the Contractor's approach to: Design Quality Control, Design Quality Assurance, Construction Quality Control, the interface with Construction Quality Assurance, the interface to resolve Design issues and changes, show the lines of authority, and effective team communications. The QCD shall illustrate the process for meeting all requirements of the Contract Documents. The Design Quality Manager shall instruct the Contractor, CDOT and Outside Agency personnel in the quality processes outlined in the QCD at the pre-construction conference so all parties can collaborate and understand roles and responsibilities effectively. The QCD should sufficiently address quality control and assurance roles and processes but in a concise manner.

At a minimum the QCD shall address the following:

1. The Contractor's Organization Chart including the Design Consultant and define by name, the Project Quality Manager, Construction Quality Manager, and the Design Quality Manager. The Contractor's Organization Chart shall illustrate: lines of authority, lines of communication, interface positions with CDOT and Outside Agencies.
2. Process Diagrams for:
 - Design
 - Quality Control
 - Quality Assurance
 - Design Review
 - Released for Construction Documents
 - Wall Plans
 - Traffic Control Plans (TCP)
 - Storm Water Management Plans (SWMP)
 - Final Design Documents
 - As Built Documents

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- Construction
- Quality Control
- Product Data Control
- Quality Assurance Interface
- Design Interface
- Request For Information (RFI)
- Field Design Changes (FDC)
- Methods of Handling Traffic (MHT)
- Public Information (PI)
- Completion Punch List Resolution

The Contractor's Process Diagrams shall illustrate the processes with a flow chart style depiction, and should minimize the written descriptions as much as possible.

As changes are made to the Contractor's Organization chart or Process Diagrams; updates shall be provided within five (5) Days.

Design Quality Control

The Quality Control Document (QCD) shall illustrate the process necessary for the Contractor to control the quality of their Design process in order to produce products that meet the requirements of the Contract Documents. The Contractor shall develop, and share with CDOT, their design review schedule to ensure quality control of the Design process.

Design Quality Assurance

In the QCD the Contractor shall illustrate the process to certify the Work as compliant with the requirements of the Contract Documents. The Contractor shall collaborate with CDOT during the Design process to ensure the appropriate product is produced and requirements are met. During Construction the Design Quality Manager (DQM) shall ensure that Release for Construction (RFC), Traffic Control Plans (TCP), Method of Handling Traffic (MHT), Request for Information (RFI), Storm Water Management Plans (SWMP), and Public Information (PI) release documents are compliant with the requirements of the Contract Documents.

The QCD shall include the process to address applicable elements of design including, civil, structural, geotechnical, survey, hydraulic, environmental, traffic, safety, public information, and temporary work. The Contractor shall identify in the QCD all applicable computer programs to develop and check designs. The QCD shall illustrate the design effort, including design reviews, constructability reviews, design meetings, independent design checks, and a basic schedule for Release for Construction Documents and Final Design Documents.

The Contractor shall identify in the QCD design input requirements. The Contractor shall illustrate how changes to design inputs are identified, reviewed, and approved by authorized personnel prior to their implementation.

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The Design Process Diagram shall also include:

1. Process to control and independently ensure that the design meets the requirements of the Contract Documents, including provisions for Subconsultant's designs and configuration management Activities. Process for approval of Released for Construction Documents and revision control.
2. Process to identify and track Design Document deliverables.
3. Process to identify, record, and track Field Design Changes (FDC), and Request for Information (RFI) responses.

Design Quality Program

The Contractor's design quality program shall include:

1. Design Progress Meetings: The Contractor shall conduct meetings to coordinate the design development within the Contractor's organizations, CDOT, Forest Service 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 and provide meeting minutes to CDOT's Project Engineer within four (4) Working Days after the meeting. These meetings shall a minimum of be bi-weekly or as requested by CDOT.
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 all plans, quantities, method statements, and schedule required to complete a given portion of Work. The schedule shall include: submittal date, planned construction start date, inspection hold points, and planned duration. Failure to provide RFC Documents that comply with the Contract in a timely manner shall be cause for the Contractor not being permitted to work on that portion of the project until a proper submittal is made. All schedule delays due to incomplete RFC Documents shall be the responsibility of the Contractor. The Contractor's Design Quality Manager shall approve RFC Documents prior to submittal to CDOT. Each RFC Documents submittal shall be submitted to the CDOT Project Engineer a minimum of two (2) weeks before planned construction. Written Acceptance of the quantities and schedule must be received from CDOT before the Work begins on that portion of the RFC. The Contractor shall include in the QCD a process for the Engineer responsible for the design to prepare, review, approve, and seal (if required) all changes, including Field Design Changes (FDC), and Request for Information (RFI) responses. FDC and RFI responses must meet the requirements of RFC documents, except the submittal timeline will be as soon as possible.

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3. Final Design Documents: The Contractor shall submit Final Design Documents to CDOT's Project Engineer for Acceptance. CDOT will 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, CDOT, or Outside Agency Acceptance Review comments. The Design Quality Manager shall ensure and provide documentation to CDOT that all review comments have been addressed.
4. Final Design Record Drawings: The final record set of drawings shall include the original Released for Construction drawings and incorporate all Field Design Changes. Each drawing shall be stamped by the Engineer of Record as responsible for the specific design element represented on said drawing.
5. As-Built Documents: As-Built Documents shall meet the requirements listed in these technical requirements. As-Built Documents shall be maintained and completed by the Contractor with final drawings updated in the electronic format of CDOT's latest CADD configuration and submitted to CDOT for Acceptance. CDOT may audit As-Built Documents to ensure completeness and compliance with the requirements of the Contract Documents.

The Contractor shall maintain a master list of approved design changes. The QCD shall include a process to communicate design changes to the construction site on a timely basis consistent with the progress of construction Activities.

Design Deliverables

The Contractor shall submit to CDOT all Structure Concept Plans, Release for Construction Documents, Final Design Documents, Final Design Record Drawings and As-Built Documents.

The Contractor shall identify on its Contract Schedules when the design deliverables identified above will be submitted to CDOT. The Contractor shall provide one set of electronic files to CDOT. As-Built Documents shall show all field installed changes from the Final Design Documents. All changes shall be noted using CADD. Hand-drawn changes will not be Accepted.

The design deliverables shall be delivered to CDOT indexed and clearly marked to indicate the date of issue and stage of development (e.g., Released for Construction, Submittal). The Final Design Documents submittal is required to facilitate CDOT's review and Acceptance of the design while the Contractor still has significant design resources on the Project.

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The form of all design deliverables shall include a title block, consistent with standard project drawing format, with the following information included as a minimum:

1. Date of issuance and including all prior revision dates.
2. Contract title and number.
3. The names of the Contractor, Subconsultants, Subcontractors, Suppliers, and manufacturers as applicable.
4. Subject identification by Contractor drawing or Contract reference.

All design deliverables shall be sealed by the Engineer consistent with applicable Legal Requirements. All design deliverables shall include a sufficient blank space, in the lower right corner, just above the title block on the drawings, and in the lower right corner of the title page of specifications and calculations, in which the Contractor's Engineer may indicate the action taken, indicating their review and approval.

If a design deliverable requires review approval from an Outside Agency or permitting authority, the Contractor shall gain written concurrence prior to submitting the design deliverable to CDOT.

When calculations accompany drawings in a submittal, the body of the calculations shall contain cross-references to the individual drawing to which the pages of the calculations pertain. Calculations required shall demonstrate conformance with the requirements of the Contract Documents.

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:

- A. All electronic drawings for the Project shall be developed in MicroStation/InRoads using CDOT's latest configuration
- B. All design deliverables shall be in English units. The Project coordinate system shall comply with the CDOT Survey Manual.
- C. The Final Design Documents and As-Built Documents shall be compiled in sequential order. All drawings/plan sets be produced using CDOT's CADD standards. The Final Design Documents and As-Built Documents submittal shall include, as a minimum:
 - (1) All design plans.
 - (2) Design and design check calculations.

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- (3) Design reports.
 - (4) Specifications.
 - (5) Quantities.
 - a. Estimated Quantities for Final Design Documents
 - b. Actual Quantities for As-Built Documents
 - (6) Shop Drawings, design, and design check calculations
 - (7) Electronic CADD files as specified elsewhere in the Contract Documents.
- D. The Utility As-Built Documents for Utility work shall be submitted to the Utility Owner for Utility Work constructed by the Contractor, within 90 Days after the Utility Owner has accepted the Utility Work. These electronic deliverables shall conform to those requirements set forth in the Contract for CADD requirements, except as modified by the specific requirements of the individual Utility Owners. The Utility As-Built Documents shall show locations of existing Utilities, structures, trees, streets, and existing highway right-of-way limits. Additionally, the Utility Owner when performing its own construction will provide the Contractor, Utility as-built drawings for their Utility Work showing the foregoing information and with one set of electronic files on CD-Rom to CDOT.

All drawings/plan sets be produced using CDOT's CADD standards. CADD files shall be in accordance with the current CDOT configuration and workspace. All CADD Files shall be documented in a tabular format describing the path, file name, and description. All As-Built Documents electronic files shall be submitted in *.dgn, *.dtm and *.pdf format.

Document and Data Approval

The Design Quality Manager shall ensure that all deliverables include a signed and dated certification by the originator of the deliverables, that the deliverable is complete, and meets the requirements of the Contract Documents.

Document and Data Changes

The Design Quality Manager 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).

Construction Quality Control

The Quality Control Document (QCD) shall illustrate the process necessary for the Contractor to control the quality of their Construction process in order to produce Work that meets the requirements of the Contract Documents. The Contractor shall be responsible for and shall perform all Materials Quality Control Testing in accordance with their QCD and the requirements of the CDOT Field Materials Manual in effect at the time of advertisement.

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Quality Personnel

The Contractor shall designate a Design Quality Manager (DQM), who shall review and approve all design submittals required by CDOT before such submittal. The Design Quality Manager shall be a Professional Engineer Registered in the State of Colorado.

The Design Quality Manager shall have responsibility for the success of the Contractor's quality program, and shall ensure that authority and responsibilities are defined in the QCD and communicated within their organization.

Field changes to any Contractor designed roadway, wall, or structural detail shall be stamped by the Contractor's Engineer, and also stamped "Release for Construction" by the Contractor's DQM and submitted to the CDOT Project Engineer 3 days prior to the construction of that portion of the Work may commence. These stamped drawings incorporating field changes shall be included in the Final Design Record Drawings. The Contractor shall develop and document procedures, instructions, and process controls to ensure the Work being produced by the Contractor meets the requirements of the Contract Documents.

All construction Quality Control testing personnel performing construction materials testing shall be qualified in accordance with Section CP-10 of the CDOT Field Materials Manual.

The Contractor shall ensure that personnel performing Work shall have the education, training, skills, experience, and certifications to meet the requirements of the Contract Documents. The Contractor shall maintain appropriate personnel records and have them available for examination by CDOT upon request.

Construction Quality Assurance

The Contractor shall be responsible for all quality control testing. CDOT will provide the quality assurance 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 any Project Special Provisions in effect at the time of project advertisement.

The Contractor shall ensure the compatibility 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) may be sampled, inspected, and tested by CDOT at any time.

The Contractor shall collaborate with CDOT during the Construction process to ensure that the appropriate Work is produced and requirements are met.

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CDOT Independent Assurance Testing (IAT)

CDOT may perform Independent Assurance Tests to ensure that:

1. CDOT Quality Assurance personnel and Contractor Quality Control personnel are trained, certified and demonstrate they understand the test procedures they are performing and;
2. The test equipment used by the Quality Assurance personnel and Contractor Quality Control personnel is calibrated and;
3. Split sample test results correlate.

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

Outside Agency Inspections

Outside Agencies such as FHWA or U.S. Forest Service shall have the right to inspect the Work, provided that the Outside Agency has jurisdiction over the Work and as required by Applicable Law.

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Deliverables

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

Deliverable	Acceptance or Approval	Schedule
Quality Control Document	Approval	15 Days following NTP
Quality Control Document Updates	Approval	Within 5 Days of change
Design Progress Meeting Minutes	Acceptance	4 Working Days after Meeting
Other Meeting Minutes (as defined in QCD)	Acceptance	4 Working Days after Meeting
Released for Construction Documents (schedule and quantities portions)	Acceptance	Two Weeks prior to Work
Final Design Documents	Acceptance	As defined in Contract Schedules
Final Design Record Drawings	Acceptance	As defined in Contract Schedules
As-Built Documents	Acceptance	As defined in Contract Schedules