

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 twenty (20) Days following Notice to Proceed (NTP), 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 with 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 Project Quality Manager shall instruct the Contractor, CDOT and Outside Agency personnel in the quality processes outlined in the QCD in a training session early in the project so all parties can collaborate and understand roles and responsibilities effectively. The QCD should not exceed 15 pages.

At a minimum the QCD will address the following:

1. The Contractor's Organization Chart

The Contractor's Organization Chart shall illustrate: lines of authority, lines of communication, interface positions with CDOT, and any Outside Agencies.

2. Process Diagrams for:

a. Design

- i. Quality Control
- ii. Quality Assurance
- iii. Design Review
- iv. Released for Construction Documents
 - 1. Traffic Control Plans (TCP)
 - 2. Storm Water Management Plans (SWMP)
- v. Final Design Documents
- vi. As Built Documents

b. Construction

- i. Quality Control
 - 1. Product Data Control
- ii. Quality Assurance Interface
- iii. Design Interface

1. Request For Information (RFI)
2. Field Design Changes (FDC)
3. Methods of Handling Traffic (MHT)
4. Public Information (PI)
5. SWMP/SWPPP Compliance
6. Punch List Resolution
7. Substantial Completion
8. Final Acceptance

The Contractor's Process Diagrams will 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 Project Quality Manager (PQM) will 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.

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.
2. Process for approval of Released for Construction Documents and revision control.
3. Process to identify and track Design Document deliverables.
4. 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, 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.
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 will 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 **Project** Quality Manager shall approve RFC Documents prior to submittal to CDOT. RFC Documents shall be submitted to the CDOT Project Engineer a minimum of one (1) week 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.

3. Final Design Documents: The Contractor shall submit Final Design Documents to CDOT's Project Engineer 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, CDOT, or Outside Agency Acceptance Review comments. The Project Quality Manager shall ensure and provide documentation to CDOT that all review comments have been addressed.
4. As-Built Documents: As-Built Documents shall be stamped by the Engineer 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, 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 two 11 by 17 inch hard copies and one set of electronic files on CD-ROM of the design deliverables 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.

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:

1. All electronic drawings and Roadway modeling for the Project shall be developed in MicroStation/InRoads using CDOT's latest configuration
2. All design deliverables shall be in English units. The Project coordinate system shall comply with the CDOT Survey Manual.
3. 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:
 - a. All design plans.
 - b. Design and design check calculations.
 - c. Design reports.
 - d. Specifications.
 - e. Quantities.
 - i. Estimated Quantities for Final Design Documents
 - ii. Actual Quantities for As-Built Documents
 - f. Shop Drawings, design, and design check calculations
 - g. Electronic CADD files as specified elsewhere in the Contract Documents.

4. 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 11 by 17 inch hard copy and 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. CDOT's configuration and workspace shall be downloaded from CDOT's website at: <http://www.coloradodot.info/business/designsupport/cadd>. 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 Project 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 Project 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 and any Standard and/or Project Special Provisions in effect at the time of advertisement.

Quality Personnel

The Contractor shall designate a Project Quality Manager (PQM), who shall provide all final checks, approvals, and certifications for quality.

The Contractor shall designate a Design Quality Manager (DQM), who shall review and approve all design submittals required by CDOT before such submittal.

The Contractor shall designate a Construction Quality Manager (CQM), who shall certify all construction quality control elements.

The Project 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, bridge, 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, before construction of that portion of the Work may commence. 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 concrete, embankment, and hot mix asphalt pavement process control tests shall meet the standards established in 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

CDOT will provide the acceptance testing and inspections on the Project. All payments for items accepted on the Project shall be based on current CDOT acceptance testing and inspection procedures. Minimum sampling and testing frequencies of the product will be based on the CDOT Field Materials Manual and any Standard and/or Project Special Provisions in effect at the time of project advertisement.

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) may be sampled, inspected, and tested by CDOT at any time.

Nonconforming Work

The Contractor shall include in the QCD procedures to develop and maintain a system to identify, control, remedy and report Nonconforming Work. The QCD 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 Approved QCD procedures. The responsibility for review and for the disposition of Nonconforming Work shall be established in the QCD. The Contractor shall identify Nonconforming Work 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. Cause of Nonconforming Work.
4. Proposed corrective action to prevent recurrence.
5. Responsibility for accomplishing corrective action.
6. Schedule for resolution.

Nonconforming Work identified by CDOT shall be conveyed in a 105 Speed Memo or verbally if resolution can be achieved within 48 hours to conform to the plans and/ or specifications.

The Contractor's Engineer shall recommend the remedy for the Nonconforming Work. CDOT shall Approve the Contractor recommendation to remedy the Nonconforming Work unless the remedy is to remove and replace the Nonconforming Work.

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. Nonconforming work will not receive progress payments in accordance with Section 2- Project Management, Progress Payment Calculations.

CDOT Independent Assurance Testing (IAT)

CDOT will 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 will 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 and the United States Air Force Academy (USAFA) shall have the right to inspect the Work, provided that the Outside Agency has jurisdiction over the Work and as required by Applicable Law.

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	Twenty (20) Days following NTP.
Design Progress Meeting Minutes	Acceptance	Four (4) Working Days after Meeting
Other Meeting Minutes (defined in QCD)	Acceptance	Four (4) Working Days after Meeting
Released for Construction Documents (schedule and quantities portions)	Acceptance	One (1) Week prior to Work
Final Design Documents	Acceptance	As defined in Contract Schedules
As-Built Documents	Acceptance	As defined in Contract Schedules
Utility As-Built Documents	Acceptance	Within ninety (90) Days after Work Completion

Project Special Provisions

REVISION OF SECTIONS 105, 106, AND 203
CONFORMITY TO THE CONTRACT OF EMBANKMENT

Sections 105, 106 and 203 of the Standard Specifications are hereby revised for this project as follows:

Subsection 105.03 shall include the following:

Conformity to the contract of embankment construction shall be determined in accordance with the following:

(a) *Quality Control Plan.* The Contractor shall be responsible for Quality Control (QC) for all embankment material on this project. The Contractor shall submit a written Quality Control Plan (QCP), including a methods statement, to the Engineer for acceptance. The QCP shall include but not be limited to the following:

- (1) Maximum lift thickness of eight inches in accordance with subsection 203.06 or as directed.
- (2) Compaction equipment capable of obtaining the specified compaction.
- (3) Water trucks with an adequate distribution system that will apply water evenly.
- (4) List of all inspection and materials testing forms and procedures to be utilized by the Contractor.
- (5) Adherence to Table 106-4 requiring minimum testing frequency.

The Contractor shall submit the QCP at least five working days prior to the start of any embankment work. The Engineer's review of the QCP will not exceed two working days. Work shall not begin until the QCP has been accepted in writing by the Engineer.

(b) *Documentation.* The Contractor shall maintain current records of quality control operation activities, and tests performed. These records shall be on the forms shown in the QCP, and shall include as a minimum, the Contractor or subcontractor, the number of personnel working, weather conditions, type of equipment being used, delays and their cause, and deficiencies along with corrective action taken. Such records shall cover both conforming and defective or deficient features. Additional documentation to the Engineer shall include all daily test results, daily inspection reports, daily non-compliance reports, and monthly certification reports. Copies of these records and a statement that work incorporated in the project complies with the Contract shall be submitted to the Engineer prior to payment for the work or upon request. Monthly certification reports shall be stamped with the seal of a Professional Engineer registered in Colorado. Failure to provide the Engineer with the necessary documentation will result in the suspension of payments on embankment until the documentation has been completed and accepted by the Engineer. CDOT Quality Assurance documentation shall not be used as supporting documentation for the Contractors certification.

CDOT or CDOT's certified representative will be responsible for Quality Assurance (QA) and Independent Assurance Testing (IAT).

Subsection 106.03 shall include the following:

Testing of embankment construction shall conform to the following:

The supervisor responsible for the direct supervision for the process control sampling and testing shall be identified in the QCP and be qualified according to the requirements of CP-10 (Note: this will require a PE or a NICET Level III certification). The technicians taking samples and performing tests must be qualified according to requirements of CP 10 (Note: this will require WAQTC qualification). A process control technician shall be required to be on-site full time whenever earthwork activities are taking place.

The following frequency guide schedule for minimum materials sampling, testing and inspection shall be used for the elements shown in Table 106-4. The project verification sampling and testing procedures shown in the CDOT Field Materials Manual under the frequency guide schedule for minimum materials sampling, testing and inspection shall be used for all other items not shown.

Table 106-4
EXCAVATION AND EMBANKMENT TESTING SCHEDULE

Pay Item	Minimum Testing Frequency Contractor's Process Control	Element	Minimum Testing Frequency CDOT verification Testing
203 EMBANKMENT	As Directed by the Engineer	Soil Survey (Classification)	See CDOT Field Materials Manual for Frequency
	1 per soil type	Moisture – Density Curve	1 per soil type
	1 per 500 cubic yards or fraction thereof.	In-Place Density	1 per 1,000 cubic yards or fraction thereof.
	1 per 100 cubic yards or fraction thereof.	In-Place Density when within 100 ft. of Bridge Approach(s).	1 per 250 cubic yards or fraction thereof.
	1 per 5,000 cubic yards or fraction thereof.	1 Point Check	1 per 10,000 cubic yards or fraction thereof.

Qualifications for testing and personnel are contained in Section 203, Chapter 200 of the CDOT Field Materials Manual, CP-10, CP 13, CP 15, and CP 80, and the CDOT Inspectors Checklist.

Subsection 203.02 (a) shall include the following:

Unclassified Excavation shall include removal of unstable or unsuitable material within the roadway as determined and directed by the Engineer.

Subsection 203.02 (c) shall include the following:

Muck shall not be considered material that would become stable and that could be compacted to the specified density requirements if spread out and allowed to dry to a moisture content conducive to compaction.

Subsection 203.13 (b) shall include the following:

The disposal of unsuitable material and replacement of embankment will not be measured and paid for separately, but shall be included in the work.

All costs associated with the Contractor's Quality Control efforts will not be measured and paid for separately but shall be included in the work.