

## 3.0 Quality Management

### 3.1 General

The Contractor shall be responsible for implementation and maintenance of an effective quality program to manage, control, document and assure all obligations of the Contractor comply with the requirements of the Contract. The Contractor shall develop and submit a comprehensive Quality Management Plan (QMP). The QMP shall document the Contractor's commitment to quality, and all quality requirements of the Contract. Processes and procedures established in the QMP shall be certified under International Organization for Standardization (ISO) 9001:2015, or equivalent ISO standard in effect on the date the QMP is submitted. The QMP shall encompass all Work performed by the Contractor and Subcontractors of all tiers. The Contractor shall obtain CDOT's Approval of the QMP in two stages: Stage 1, Approval of all non-construction related procedures and plans; and Stage 2, Approval of all construction-related procedures and plans.

The QMP shall delineate how the Contractor will ensure that all disciplines, aspects, and elements of the Work shall comply with the requirements of the Contract.

The QMP shall cover temporary and permanent components of the Work.

The QMP shall include procedures and methods that define how the Contractor will collaborate with CDOT through CDOT's quality assurance oversight program as described in Section 3.7.

The QMP shall describe the Contractor's quality policy, approach to Process Control (PC) and Independent Quality Control (IQC) relative to design, construction, and Work management, quality improvement, quality personnel, and training in the QMP. The QMP shall list procedures for meeting all requirements of the Contract. The Contractor shall submit the Stage 1 QMP for non-construction related Work to CDOT for Approval prior to issuance of NTP1. The QMP for all remaining Work (Stage 2) on the Project must have CDOT's Approval prior to the issuance of NTP2. Any subsequent addenda to the QMP, required during execution of the Work, shall require CDOT's Approval prior to implementation.

The Contractor shall update and submit to CDOT for Approval its QMP when its own quality management organization detects systemic or fundamental breaches of the Contract or deficiencies in the manner the Work is inspected or tested, including breaches or deficiencies that have caused or that may cause Nonconforming Work to be performed, or when CDOT advises the Contractor of such a problem. The Contractor shall also revise the QMP should any of the following conditions exist:

1. QMP or procedure within the QMP no longer adequately addresses the matters it was originally intended to address;
2. QMP or procedure within the QMP does not conform with the Contract;
3. An audit by the Contractor or CDOT identifies a deficiency in the QMP requiring an update;

4. Organizational structure changes require revision to the QMP;
5. The Contractor is undertaking, or about to undertake, activities that are not covered within the current QMP; or
6. CDOT requires the QMP to be updated at its request.

## 3.2 Administrative Requirements

Quality Systems Procedures shall adhere to the following requirements:

1. Be consistent with the requirements of this Section 3.2 and Contractor's stated quality policy.
2. Include all Work methods and the enforcement and implementation of these work methods through best practice. However, it is inevitable that situations will arise that require a departure from the norm. These conditions shall be anticipated in the procedures and shall allow for control of these activities.
3. Define the liaison and interface between the quality organization and the design and construction arms of the Contractor.
4. The quality procedures shall, as a primary objective, be written with the intent of gaining employee understanding of the system.
5. Describe the rationale for the procedures selected and, if the procedures do not address every provision of this Section 3.2, to explain why the standard is not applicable in their particular situation.
6. The following list of procedures (items a through u) shall serve as the starting point for defining Contractor's quality management system:
  - a. Procedure for the preparation, control, and distribution of the Quality Management Plan;
  - b. Scope;
  - c. Key Personnel;
  - d. Organizational/technical interfaces;
  - e. Design input requirements;
  - f. Design output requirements (deliverables);
  - g. Design Reviews;
  - h. CDOT participation;
  - i. Levels of responsibility and authority;
  - j. Procedure to control, verify, and validate the design;
  - k. Procedure for document issue, approval, and revision;
  - l. Procedure for the identification of, and where required by Contract the traceability of, deliverable items, such as Release for Construction Documents and As-Builts;

- m. Procedure for the verification and control of computer programs used in design;
  - n. Procedures for inspecting, testing, and calibrating equipment;
  - o. Procedures for handling Nonconforming Work;
  - p. Procedures for environmental compliance;
  - q. Procedures for corrective/preventive actions;
  - r. Procedures for handling storing, packaging, tracking and submitting Deliverables;
  - s. Training processes;
  - t. Procedures for internal quality audits; and
  - u. Procedure for management review.
7. The implementation of the quality system shall be demonstrated by internal quality audit reports, the trending of nonconformance, records of root-cause analysis, records of corrective and preventive actions, and records of CDOT audits and observations.
8. Documented procedures may make reference to specifications that define how an activity is performed. Procedures shall describe the process steps of what needs to be done and work instructions shall prescribe how it is to be done.

### 3.2.1 Quality Policy

The Contractor shall develop a written policy for quality, including objectives for, and its commitment to, quality. The Contractor's executive management shall ensure that this policy is implemented at all levels of the Contractor's 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 office and the Site. The statement shall explain the Contractor's commitment to quality and the responsibility the Contractor has for assuring that it meets the quality requirements included in this Section 3.

The quality policy statement shall be made known to and understood by all Contractor employees, sub-consultants, Subcontractors, and Suppliers. The Contractor shall conduct and document a formal training program for all Contractor employees, sub-consultants, Subcontractors, and Suppliers on the quality policy prior to their participation in activities monitored by the Contractor under the QMP.

The QMP shall include the Contractor's executive management's quality policy. The QMP shall delineate the procedure used by the Contractor's executive management to implement the Contractor's quality policy.

### 3.2.2 Quality Planning

The Contractor shall provide evidence of quality planning that ensures specific requirements of the Contract have been identified and incorporated into the

documented quality system. CDOT's requirements represent the minimum requirements.

The Contractor shall perform IQC inspections during all phases of the Work from NTP1 until Final Acceptance to assure that the Work meets, and is being performed in accordance with, the Contract.

The Contractor shall include in the QMP its planning methods to meet the requirements of the Contract. The Contractor shall include, at a minimum, the activities below in its quality planning efforts to meet the Contract requirements for the Work:

1. Define and develop quality objectives for the Work;
2. Identify the necessary processes, resources, and IQC personnel that are needed to assure that Contractor obligations meet the requirements of the Contract, including, but not limited to, design, construction, Environmental Compliance, Public Information requirements, Transportation Management Plan requirements, safety, Civil Rights, training, project management processes, and the QMP;
3. Ensure the compatibility of design, construction, installation, public information, inspection, and testing procedures;
4. Develop and maintain up to date procedures for PC, IQC, and quality improvement;
5. Identify and define all measurable Contract requirements;
6. Identify quality hold points for Contractor IQC testing and inspection and to allow CDOT the opportunity to perform its owner verification responsibilities;
7. Identify, define, and implement standards of workmanship for all applicable work features (e.g., concrete finishing);
8. Identify, define, prepare, and maintain quality records and quality plans for all elements of design, including, but not limited to, wet and dry utilities, architectural, civil, structural, geotechnical, survey, hydraulic, environmental, traffic, safety, Right-of-Way (ROW), ITS Work, and temporary Work;
9. Develop a procedure for preparation, control, Approval, and distribution of the QMP;
10. Develop a procedure for IQC auditing to ensure the Contractor, Subcontractors, and Suppliers of material understand and are effectively implementing the QMP;
11. Develop a procedure for corrective and preventative actions regarding quality compliance and implement the quality improvement plan to address corrective Work;
12. Develop a procedure and ensure the Contractor's executive management reviews the QMP at planned intervals to ensure its continued suitability, adequacy and effectiveness. Such reviews should include PC/IQC results, owner verification results, status of corrective/preventive actions, follow-up items

from previous management reviews, changes to the QMP, and recommendations for improvement; and

13. A systemic process for ensuring quality regardless of production or scheduling needs.

### **3.2.3 Process Control**

The Contractor shall be responsible for establishing, documenting, and implementing, a PC program. The PC program shall be described in the QMP and 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 production processes. The Contractor shall conduct examinations of the quality of workmanship to confirm that all Work is being performed in accordance with all Contract requirements. Appropriate follow-up inspections, sampling, and testing of materials shall be performed as each item of Work progresses to assure consistency in workmanship, compliance with Contract requirements, (including design and construction documents), and satisfactory performance of the Work in service.

Construction PC materials testing activities shall utilize statistical analyses of material test results, including mean, variance, range, and running averages; measurements; clearances; and interactions between PC and IQC. The results of these activities shall be used by the Contractor to set up control charts to monitor and track variations in materials over time. The control charts and the analytical results on which they are based shall be provided to CDOT within 24 hours when requested.

Tests or inspections performed by production or PC personnel as part of the PC process shall not be used to satisfy the IQC requirements.

### **3.2.4 Control of Inspection, Measuring, and Test Equipment**

Contractor shall establish and maintain documented procedures to control, calibrate, and maintain inspection, measuring, and test equipment - including test software - used by Contractor to demonstrate the conformance of product to the specified requirements. Inspection, measuring, and test equipment shall be used in a manner that ensures that the measurement uncertainty is known and is consistent with the required measurement capability.

Contractor shall ensure Quality Control is being performed by a group completely independent of the Contractor's Design Build Project Manager and Construction Manager. The Independent Quality Control firm or function group (IQCF) shall be an independent group employed by the Contractor responsible for administering and managing the construction IQC Inspection, sampling, and Testing. The IQCF and any Subcontractors or sub-consultants thereto must not have any responsibilities for Construction Work scheduling or production activities.

The Contractor shall establish, document and implement an IQC program. The Contractor shall include in the QMP the methods and procedures by which the Work

will be certified by the Contractor as complying with the requirements of the Contract.

The IQC program shall be separate from the Contractor's PC program.

At a minimum, the IQCF testing shall include the observations, measurements, and documentation specified in CDOT *Field Materials Manual* and its Frequency Guide Schedule for minimum materials sampling, testing, and inspection for all quality acceptance tests required. Items identified as pre-tested or pre-inspected by CDOT shall remain the responsibility of Contractor. The IQCF shall document the results and show if the test passed or failed based on the "pass/fail criteria" established in the Contract. The IQCF shall include failing tests results in the test documentation.

IQC personnel shall not participate in any PC activities and shall be independent of the PC personnel.

The Contractor shall identify in the QMP all necessary resources and personnel to perform all IQC activities required to ensure all Work meets the requirements of the Contract. The QMP shall identify the construction quality hold points for IQC testing and inspection and shall describe how the Contractor will notify CDOT so that it may have the opportunity to perform its owner verification responsibilities.

### **3.2.5 Quality Improvement**

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

The Contractor shall schedule and perform internal quality audits on the basis of the status and importance of the activity to be audited. The Contractor shall conduct weekly quality meetings with affected Contractor staff including construction specialty leads, and CDOT to discuss open Nonconformance Notices (NCN)s/Nonconformance Reports (NCR)s and quality issues. All unresolved quality issues, including but not limited to NCRs and owner verification NCNs, shall be discussed at these meetings, until resolved. The Contractor shall submit an updated Nonconforming Work log to CDOT weekly (or as otherwise Approved by CDOT) and shall use the log to look for Nonconforming Work trends to determine if Corrective Actions are needed.

The Contractor shall ensure timely implementation of the necessary Corrective Actions to improve any nonconformance found during audits. The Contractor's follow-up activities shall ensure the implementation and effectiveness of the Corrective Action taken. Corrective Actions shall identify the root causes of deficiencies and shall be developed, implemented, and tracked to prevent the recurrence of future nonconformance. Corrective Actions shall be monitored through review of documents, surveillance, or follow-up audits. The Contractor shall keep records of Corrective

Actions together with the respective audit records and submit those records to CDOT upon request.

The Contractor shall consider CDOT's verification audits and the overall project goals to determine where Contractor quality improvement audits shall be performed and potential Corrective Actions to be implemented.

### 3.2.6 Quality Personnel

The Contractor's executive management shall have overall responsibility for success of the QMP. The Contractor's executive management shall have the responsibility to ensure that personnel performing PC and IQC activities have the appropriate education, training, skills, and experience to meet the requirements of the Contract. The Contractor shall designate a Design Build Quality Manager (DBQM) who shall not report to Contractor's Design Build Project Manager, but shall be directly responsible to and report to the Contractor's executive management. The DBQM shall provide all final checks, approvals, and certifications for quality. The DBQM shall be responsible for assuring, certifying, and providing documented evidence that the Work meets the requirements of the Contract. The DBQM shall have the authority and responsibility for the success of the Contractor's quality program, and shall ensure that authority and responsibilities are defined and communicated within the organization.

The DBQM shall be the primary point of contact to CDOT for all issues relating to Contractor's Quality Management Plan, including preparation, review, implementation, and updates. The DBQM, irrespective of other responsibilities, shall have defined authority and responsibility for the following:

1. Ensuring that a quality system is established, implemented, and maintained;
2. Reporting quarterly on the performance of the quality system to Contractor's executive management and CDOT for review and as a basis for improvement of the quality system; and
3. Direct supervision of the IDQM and IQCM and their respective staffs.

The Contractor shall assign an Independent Design Quality Manager (IDQM) that reports directly to the DBQM and shall be responsible for all design quality control activities for the Work. The Contractor shall identify a Design Process Control Manager (DPCM) for all design activities. The DPCM may be the Contractor's Design Manager and shall be responsible for all design PC activities. The IDQM shall not be involved with Construction Work scheduling or production activities, and shall ensure that the methods and procedures contained in the Approved QMP, related to design, are implemented and followed by the Contractor, subcontractors, fabricators, suppliers, and vendors in the performance of the Work.

The Contractor shall assign an on-site Construction PC Manager (CPCM) who shall be responsible for management of the PC aspect of the QMP. The CPCM shall not be involved with Construction Work scheduling or production activities, and shall report directly to the Contractor's management team. The CPCM shall ensure that the methods and procedures contained in the Approved QMP, related to construction, are

implemented and followed by the Contractor, subcontractors, fabricators, suppliers, and vendors both on-site and off-site in the performance of the Work.

The Contractor shall assign an on-Site Independent Quality Control Manager (IQCM) who shall be a member of the IQCF and independent of Construction Work scheduling or production and shall be responsible for management of the IQC aspect of the QMP. The IQCM shall report to the DBQM and to CDOT. The IQCM shall not report to any person or party directly responsible for design or construction production. The IQCM may be the DBQM.

The IQCM and CPCM shall both have or obtain the American Society for Quality (ASQ) certification as Quality Inspector, Quality Engineer, or Manager of Quality as an NTP2 Condition.

The Contractor's DBQM, IQCM, IDQM, CPCM, and DPCM shall review and approve the QMP prior to submittal to CDOT. The Contractor shall assure, certify and provide documented evidence that the Work meets the requirements of the Contract. At a minimum, the DBQM shall report the status of the Work's quality monthly to CDOT.

All construction IQC testing personnel and PC testing personnel performing concrete and hot bituminous pavement process control tests shall meet the standards established in Section CP-10 of CDOT *Field Materials Manual*.

All construction IQC inspection personnel performing fabrication inspection of structural steel elements shall be qualified in accordance with Section 4.0 of CDOT *Staff Bridge Fabrication Inspection Manual, Fabrication Inspection of Structural Steel Items for CDOT Roads and Bridge*.

All construction IQC testing and inspection personnel performing inspections and tests for pre-stressed and precast concrete products shall be qualified in accordance with Section 3.0 of CDOT *Staff Bridge Fabrication Inspection Manual, Fabrication Inspection of Pre-stressed and Precast Concrete Products*.

All construction IQC testing and inspection personnel performing inspections and tests for Electrical Work shall meet the requirements of Licensed Journeymen Electrician or Licensed Master Electrician defined in Book 1 Appendix A.

The Contractor shall ensure that personnel performing Work shall have the education, training, skills, and experience to meet the requirements of the Contract. The Contractor shall maintain appropriate personnel records that may be examined by CDOT upon request.

### **3.2.7 Training**

The Contractor shall establish and maintain documented procedures for identifying training needs and requirements 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 (e.g., Materials Testing and Inspection Plan (MTIP), Contractor auditing procedures, etc.).

The Contractor shall provide training to all personnel that may interface with CDOT's oversight efforts (audit process) to ensure they understand their roles and responsibilities for cooperating and responding to audits.

### 3.3 Quality Management Plan Requirements

The QMP shall state the Contractor's commitment to quality and provide a clear definition of the scope of activities and detail the methods to ensure the Work meets the requirements of the Contract. The QMP shall list all deliverables to CDOT, as required by the Contract and this Section.

#### 3.3.1 Responsibility and Authority

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, communication, and interfaces with CDOT; other involved agencies; and any other team members having a significant quality role, including subconsultants, Subcontractors, and Suppliers. The DBQM, IDQM, DPCM, CPCM (and PC staff) and IQCM (and IQC staff) shall be shown on the organization chart to report to the Contractor's executive management and be independent of the Contractor's Design Build Project Manager. The Contractor shall update the organization charts and distribute those charts to CDOT when any changes to the organization are made.

The QMP shall describe the roles and responsibilities of the DBQM, IDQM, DPCM, CPCM, IQCM, PC and IQC staff, and other key personnel; and shall describe their authority to implement quality improvements for the Work.

The Contractor's IQC managers and IQC staff shall have no responsibilities in the management and production of the Construction Work and IQC personnel shall have the authority to stop Work that does not comply with requirements of the Contract.

The responsibilities of all personnel who manage, perform, and ensure the quality of the Work include:

1. Initiate action to prevent the occurrence of Nonconforming Work;
2. Identify, evaluate, and document quality problems;
3. Recommend or initiate quality improvement solutions through established organizational channels;
4. Ensure the implementation of quality improvement solutions; and
5. When Nonconforming Work is identified, stop all Work that is affected by the Nonconforming Work until the deficiency is corrected.

6. The DBQM, IDQM, DPCM, CPCM, and IQCM shall have the following responsibilities defined in the QMP:
  - a. Facilitate compliance of Work with the requirements of the Contract and the Approved QMP;
  - b. Approve Contractor quality processes and procedures;
  - c. Provide adequate resources and trained personnel for PC and IQC activities;
  - d. Ensure the adequacy and enforcement of quality procedures, processes, inspections, and tests for all Work;
  - e. Establish and implement procedures to control and ensure the Work performed by subconsultants, Subcontractors and Suppliers meet the requirements of the Contract;
  - f. Ensure the QMP is being implemented and report in writing regularly to the Contractor's executive management regarding the status of the implementation of the QMP;
  - g. Ensure that quality records are properly prepared, completed, maintained, and delivered to CDOT, as required by the Contract, to provide evidence of PC and IQC activities performed and quality results achieved;
  - h. Ensure that IQC staff is independent of the Contractor's Design Build Project Manager and regularly reports to the Contractor's executive management; and
  - i. Continually promote awareness of the requirements of the Contract throughout the Contractor's entire project organization.

## 3.4 Independent Quality Control

### 3.4.1 General

The Contractor shall establish, document, and implement an IQC program. The Contractor shall include in the QMP the methods and procedures by which the Work shall be certified by the Contractor as complying with the requirements of the Contract.

The QMP shall establish procedures for procuring services. The procedures shall include a review and approval process by the Contractor for adequacy of specified technical requirements and the adherence to quality requirements.

The QMP shall describe the measures to be taken to ensure that Subcontractors, Suppliers and subconsultants meet, implement, document, and maintain the QMP requirements.

The selection of Subcontractors, Suppliers and subconsultants and the type and extent of control exercised by the Contractor shall be dependent upon the type of product or service and, where appropriate, on records of Subcontractors', Suppliers' and subconsultants' previously demonstrated capability and performance.

### 3.4.2 Design Quality Control

The QMP shall include procedures that address all elements of design, including, but not limited to, wet and dry utilities, architectural, civil, structural, geotechnical, survey, hydraulic, landscaping, aesthetics, environmental, traffic, safety, ROW, ITS Work, and temporary Work. The Contractor shall identify in the QMP all applicable computer programs to develop and check designs.

The QMP shall describe how the design team plans and schedules the design efforts, including task force meetings, design reviews, constructability reviews, design meetings, independent design checks, and discuss how these activities are accounted for in the overall Project Schedule.

The Contractor shall identify in the QMP design input requirements. The Contractor shall perform ongoing audits of the design input requirements. The Contractor shall maintain an accessible, centrally controlled design manual, database, or list that contains all relevant design inputs to be used by design personnel for the Work. The Contractor shall provide a process in the QMP to ensure that the design inputs are communicated to, and accessible by, the relevant designers responsible for incorporating design inputs into the design. The Contractor shall include in the QMP how changes to design inputs are identified, reviewed, and approved by authorized personnel prior to their implementation. The QMP shall also include:

1. Procedures to control and independently ensure that the design meets the requirements of the Contract, including provisions for subconsultant's designs and configuration management activities;
2. Procedures to identify and track design document deliverables;
3. Procedures for Contractor approval, tracking and recording revisions to Release for Construction (RFC) Documents. The Contractor shall have a formal procedure for comment resolution included in the QMP;
4. Procedures for Contractor approval of RFC Documents; and
5. Procedures for approval of supplier-provided design drawings (e.g. shop drawings), including opportunity for CDOT to perform audits.

The Contractor's design quality program shall include processes based on Contractor's obligations under this Section 3.4.2.

#### 3.4.2.1 Preliminary Plan Packages

The Contractor shall prepare, and submit to CDOT for Acceptance, preliminary (30% level) plan packages which (1) show how the Contractor's design meets the Book 2 obligations and (2) include:

1. Cover sheet;
2. Typical sections;

3. Plan and profile for the EJMT North and South tunnel piping layouts
4. Heat trace/freeze protection limits
5. Electrical One-Line and SCADA Block Diagrams
- ~~6. Generator and outdoor equipment location with 3D rendering~~
- ~~7.6. Standpipe Drop Elevation View with 3D rendering~~

#### **3.4.2.2 Task Force Meetings**

The Contractor shall conduct weekly task force meetings to coordinate the design development within the Contractor's organizations and with 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 for Acceptance within five Working Days after each meeting. The Contractor shall provide final minutes to CDOT via CDOT's DCS on a monthly basis.

#### **3.4.2.3 Design Progress Review Meetings**

The Contractor shall hold one design progress review meeting during the design development process (e.g., 90% package) and invite CDOT to attend. The design progress review meetings shall be scheduled, conducted, and documented by the Contractor. The Contractor shall take meeting minutes and submit those minutes to CDOT for Acceptance within five Working Days after each meeting.

#### **3.4.2.4 Final (100% Level) Plan Package**

The Contractor shall prepare the final (100% level) plan packages showing how the Contractor's design meets the Book 2 obligations and submit to CDOT for Acceptance. After the review period, the Contractor shall conduct a comment resolution meeting with CDOT. The Contractor shall take meeting minutes and submit those minutes to CDOT for Acceptance within five Working Days after each meeting.

#### **3.4.2.5 RFC Documents and revisions to RFC Documents**

RFC Documents shall be submitted for Acceptance by CDOT. The RFC Documents shall include an MTIP. This plan shall give testing quantities and frequencies, and IQC inspection quality hold points to confirm minimum QMP requirements have been met. If referenced in the MTIP and Approved by CDOT, the Contractor may use alternative methods to track quantities, frequencies, and hold points to ensure minimum requirements have been met. The Contractor's Design Build Quality Manager, or appointed designee, shall approve the RFC Documents prior to RFC. The Contractor shall submit one electronic copy of the RFC Documents to CDOT. The Contractor's IQC process for the RFC Documents shall be thoroughly documented in the Contractor's QMP.

#### 3.4.2.6 RFC Documents for Structure Construction

Prior to release of RFC Documents for structure construction, the following items shall be required:

1. The independent design check shall have been completed per CDOT *Bridge Design Manual* and the original final structural design calculations shall be revised and corrected based on comments from the independent design check for the structural element to be constructed.

#### 3.4.2.7 As-Built Documents

As-Built documents shall be submitted to CDOT for Acceptance. CDOT may audit 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 addressed, resolved, and incorporated, to the satisfaction of CDOT, any prior Contractor or CDOT comments. The Contractor shall ensure and provide documentation to CDOT that all review comments have been addressed. The As-Built documents shall be bundled into packages that match the RFC design Deliverable packages. The As-Built documents submittal shall include:

1. All plans reflecting RFC Documents or revisions to RFC Documents;
2. Resolution of nonconformance;
3. Design calculations;
4. Design reports;
5. Specifications;
6. Electronic CADD files; and
7. Index summarizing all revisions to initial RFC Documents.

The Contractor shall keep one hard copy set of plans, reviewed shop drawings and working drawings available on the project site at all times. This set shall be defined as the construction drawings. The Contractor shall note on these construction drawings all changes and deviations from the work shown on the plans, shop drawings and working drawings. Field routing of conduit, pathways, connections, and in-line splicing not detailed on the plans shall be captured in the construction drawings and recorded in the as-builts. The construction drawings shall be kept current as the work progresses and notations shall be made within seven days of the change or deviation.

The first sheet or page of each set of construction drawings shall be stamped "As Constructed" and signed by the Contractor. These drawings will be the basis of the electronic "As-Built" set.

#### 3.4.2.8 Licensed Engineer Responsibility for Design Changes

The Contractor shall include in the QMP a process for a licensed engineer in responsible charge for the design to prepare, review, and approve all changes, including field design changes, RFC Documents, and As-Built documents. The

Contractor shall maintain a master list of approved design changes. The QMP shall include a process to communicate design changes to those completing the Work on a timely basis consistent with the progress of construction activities.

#### **3.4.2.9 Environmental review**

The Contractor shall include in the QMP a process for Environmental review prior to submission of final (100% level) plan packages showing how the Contractor's design meets the Environmental Requirements.

### **3.4.3 Construction Quality Control**

The Contractor shall perform and document all required construction PC and IQC activities necessary to control the Work. The QMP shall extend to both permanent and temporary Work (erosion control, traffic control, drainage, etc.). Records of inspection and testing activities (other than materials inspection and testing) shall be submitted to CDOT through the project DCS. Records of level 1 and level 2 materials testing, as defined in CDOT *Field Materials Manual*, shall be submitted to CDOT through CDOT's quality management system. CDOT will provide user accounts and training for use by the Contractor. Materials test reports will also require entry of meta-data fields for analysis and comparison to CDOT's verification test results.

As a minimum, the Contractor's construction IQC Program shall include the elements defined below:

#### **3.4.3.1 Certification**

The Contractor shall include in the QMP a process to submit certificates to CDOT at the following times that the Work performed meets the requirements of the Contract:

1. prior to Project Completion;
2. prior to Final Acceptance; and
3. at any other time requested by CDOT.

#### **3.4.3.2 Inspection**

The Contractor shall include in the QMP, and submit to CDOT for Approval, an 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 submit to CDOT (A) all records of inspection and testing through the project DCS and (B) level 1 and level 2 records of materials testing, as defined in CDOT *Field Materials Manual*, through CDOT's quality management system. 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 thickness, rebar clearance/size, locations, elevations, stationing, etc.). The Contractor shall include failing inspection results, when applicable, in the inspection documentation.

### 3.4.3.3 Testing

At a minimum or unless otherwise specified in this Contract, the Contractor shall follow CDOT *Field Materials Manual* and its Frequency Guide Schedule for minimum Materials sampling, testing, and inspection requirements identified under the column titled "Work Verification Sampling & Testing Frequency" for all IQC tests required. The Contractor shall document the results of all testing (showing if the test passed or failed based on the "pass/fail criteria" established in the Contract) and submit such results to CDOT through the project DCS (other than the results of level 1 and level 2 materials testing, as defined in CDOT *Field Materials Manual*, which shall be submitted through CDOT's quality management system). 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 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 and include the following:

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

### 3.4.3.4 Certificate of Compliance, Certified Test Report and Buy America documentation

The Contractor shall include in the QMP a method of handling and documenting work/products accepted in the Work by Certificate of Compliance (COC) or Certified Test Report (CTR).

The Contractor shall include in the QMP a method for documenting and tracking, on a basis consistent with Contractor's Progress Reporting, compliance with Buy America Requirements of 23 CFR 635.410, and at a minimum shall address the following obligations of the Contractor:

1. The Contractor shall maintain on file certifications that every process, including the application of a coating, performed on steel or iron products

either has or has not been carried out in the United States of America. This certification applies to every iron or steel product that requires pre-inspection, pretesting, certified test results, or a certificate of compliance. The Contractor shall obtain such a certification from each supplier, distributor, fabricator, and manufacturer that has handled each steel or iron product. These certifications shall create a chain of custody trail that includes every supplier, distributor, fabricator, and manufacturer that handles the steel or iron product. The lack of these certifications shall be justification for rejection of the steel or iron product.

2. The Contractor shall maintain a document summarizing the date and quantity of all steel and iron material delivered to the Project. The document shall show the pay item, quantity of material delivered to the Project, along with the quantity of material installed by the cutoff date for the monthly Progress Report. The summary shall also reconcile the pay item quantities to the submitted Buy America certifications. The Contractor shall also maintain documentation of the project delivered cost of all foreign steel or iron permanently incorporated into the Project. Such summary and the cost information shall be submitted to the IDQM within seven Days of the cutoff date for each monthly Progress Report. A monthly summary shall be required even if no steel or iron products are incorporated into the Project during the month. The summary document does not relieve the Contractor of providing the necessary Buy America certifications of steel and or iron prior to permanent incorporation into the Project.

The Contractor shall obtain COCs and CTRs prior to incorporation in the Work and maintain a complete log of all COCs and CTRs. The Contractor shall make the log and all COCs/CTRs available for owner verification at any time during normal business hours and shall submit the COC/CTR log for Acceptance prior to Project Completion.

The Contractor shall include in its COC/CTR log signed certification that all materials represented by each COC/CTR were installed in the Work. Certification shall be in accordance with requirements of the Contract.

#### **3.4.3.5 Quality Reviews**

The Contractor's DBQM or designated representative shall document formal reviews to verify that the Approved QMP is being effectively implemented.

#### **3.4.3.6 Environmental compliance in Construction**

The Contractor shall include in the QMP a Section detailing the IQC activities that will be performed to ensure compliance during construction of all environmental requirements. These elements include but are not limited to: water quality, protection of wetlands and other sensitive areas, aesthetics, and hazardous materials.



### 3.4.4 Materials Testing and Inspection Plan

The Contractor shall prepare and implement a MTIP as part of the QMP that includes the appropriate criteria, tests, and inspection requirements identified in CDOT's *Standard Specifications, Field Materials Manual, CDOT Staff Bridge Fabrication Inspection Manual*; Contractor-prepared inspection checklists; and requirements as set forth herein.

The MTIP shall describe all of the proposed inspections and tests procedures, including products provided by suppliers during the manufacturing, receiving, and installation process, to ensure the requirements of the Contract are met. The MTIP shall identify all inspections and tests required and include, at a minimum, reference to the requirements of the Contract, frequency of the inspections and tests, and the Contractor-prepared IQC processes. Where no inspections or test standard exists in any of CDOT's manuals, the Contractor shall develop criteria, in writing, based upon the best-available industry standard information and technology.

The MTIP shall include procedures for delivery, handling, and storage of furnished products ensuring that they are properly handled and stored to prevent damage, deterioration, or theft. It shall also document procedures for stored items and materials consistent with the expected duration and type of storage, and procedures for monitoring special processes utilized in fabrication, assembly, and testing of specified products. Special processes are those requiring qualified/certified production, inspection, and test personnel to perform highly skilled work, such as welding, brazing, soldering, non-destructive testing, machining, coating, or plating.

The MTIP shall describe all IQC inspection and test activities to be carried out including quality hold points, and establish authority within the Contractor's organization for releasing Work beyond the quality hold point. While the Contractor shall notify CDOT when Work has progressed to a quality hold point, it shall be the responsibility of the Contractor's Quality Managers to verify that all requirements have been met prior to allowing the Work to progress.

The MTIP shall include a summary of activity-specific material quantities to document that the minimum sampling, testing, and inspection requirements have been met. This summary shall be performed and provided to CDOT for Acceptance monthly. The Contractor may follow CDOT Form 250 as a minimum basis for their materials documentation record.

The MTIP shall include processes to control, calibrate, and maintain test 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:

1. Identify the test required and the accuracy required, and select the appropriate test equipment;
2. Define procedures to calibrate all test equipment prior to initial use and at prescribed maintenance intervals against certified equipment and

measurement standards of the National Institute of Standards and Technology or other similar recognized technical standards customarily accepted in the industry. Where no standard exists, the basis for calibration shall be developed in writing based upon the best-available information and technology;

3. Identify test equipment with a suitable indicator to show the calibration status of the test equipment;
4. Maintain current calibration records for test equipment;
5. Define procedures to ensure that environmental conditions are suitable for calibrating test equipment;
6. Define procedures to ensure that the handling and storage of test equipment is such that the accuracy and fitness for use is maintained;
7. Define procedures to safeguard test equipment, including test hardware and test software, from adjustments that would invalidate calibration settings; and
8. Identify procedures with respect to the paving repairs for the Project that includes the following:
  - a. A thorough definition of pavement smoothness and quality, which shall be the same for all travel lanes and shoulders, and the identification of steps for maintaining these criteria, including defined hold points and potential corrective measures.

### 3.4.5 Quality Hold Points

Contractor shall establish Quality Hold Points (QHPs) at stages of the construction progress to ensure Work is performed in accordance with Contractor's Quality Management Plan and within the terms and conditions of the Contract. Prior to reaching the first instance of any QHP, the Contractor's DBQM, IQCM, and IDQM or Design delegate as Approved by CDOT shall meet to review documentation and procedures for PC/IQC, including but not limited to material certifications, daily inspection records, material testing results, survey results, permits, and material placement records. The Contractor shall invite CDOT to each of these meetings. Contractor's DBQM shall coordinate group members to ensure that QHP checks are accomplished in a timely manner so that Contractor is not delayed. When an identified QHP is reached, the DBQM shall notify both IQC and CDOT. IQC shall be solely responsible for verifying and documenting whether Work has been completed for the QHP. Notification that a QHP has been reached while Work is still being performed or not allowing adequate time to complete the QHP review and opportunity for adjustments (e.g., concrete trucks are queuing while reinforcement is still being placed and QHP is being reviewed for a specified unit) shall result in the issuance of a Nonconformance Report.

At a minimum, Contractor shall establish QHPs at the following stages of construction:

#### 3.4.5.1 Environmental:

1. After the establishment of Water Quality BMPs, and prior to initial ground disturbance.

2. At the end of each month to review Contractor's weekly and post-storm inspections.

#### **3.4.5.2 Embankments:**

1. After the completion of drainage and Utility Relocations and prior to backfill.
2. After clearing, grubbing, and excavation to check subgrade.
3. Per specifications for lift requirements at 5 foot intervals of embankment construction.
4. At the completion of embankment placement.

#### **3.4.5.3 Structures:**

1. At the completion of placement for footing reinforcement steel and prior to the placement of concrete.
2. After the completion of the first component to receive specified aesthetic tunnel wall treatment and prior to proceeding with the construction of subsequent components.
3. After the completion of the core drilling through the plenum floor prior to fire supply piping installation.

#### **3.4.5.4 Utilities/Piping:**

1. After the installation of direct-burial duct banks and prior to backfill operations.
2. For concrete-encased duct banks, after the installation of conduits and prior to the placement of concrete.
3. For all Utility/Piping lines intended to transport pressurized materials and lines intended to carry liquids, after the installation and prior to the completion of pressure testing.
4. After the completion of the installation of piping support brackets and prior to filling the piping with water.
5. After the installation of the piping, fittings, valves, and other related elements and prior to filling the piping with water and installing any insulation (rough-in inspection).
6. Prior to installation of insulation and concealment of piping, a hydrostatic test must be successfully performed.

#### **3.4.5.5 Paving patching:**

1. Before the placement of each course above subgrade on permanent roadway components.
2. Before the placement of each lift of asphalt or Portland cement concrete.

#### 3.4.5.6 ITS:

1. After installation of manhole, pull box, or conduit and prior to backfilling.
2. After fiber installation and prior to fiber splicing or cutover.

#### 3.4.5.7 Electrical Work

1. Prior to energization, but after terminations are complete.
2. After installation of conduit and prior to backfill of trench or excavation.
- ~~3. Prior to installation of Generator and Transformer.~~
- ~~4.3.~~ Prior to installation of 25kV GIS switchgear.

### 3.4.6 Reporting and Record-Keeping of Quality Documentation

The Contractor shall maintain construction workmanship and materials quality records of all inspections and tests performed per the QMP. These records shall include factual evidence that the 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. These records shall cover both conforming and Nonconforming Work, and shall include a statement that all supplies and materials incorporated in the Work are in full compliance with the Contract.

The Contractor's Quality Managers shall ensure that quality records are properly prepared, completed, maintained, and delivered to CDOT, as required by the Contract, to provide evidence of the quality activities performed and quality results achieved.

The Contractor shall submit all IQC test measurements and test results, including failing results, and inspection records. The Contractor shall submit test data and approved test results to CDOT for Information using the project DCS (or, in the case of data and results related to level 1 and level 2 materials testing, as defined in CDOT *Field Materials Manual*, through CDOT's quality management system). IQC records will be visible to CDOT within 24 hours following the inspection or test completion. The responsible technician and the technician's supervisor shall sign the daily test reports.

The Contractor's Quality Managers shall also maintain a daily log of all inspections performed for both Contractor and sub-contractor 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*.

To enhance coordination of CDOT's Independent Assurance activities during construction, the Contractor shall provide CDOT with a weekly look ahead of specific

scheduled construction activities designating location and planned quantities of materials to be placed, and protocols for identifying completed Work. The Contractor shall provide CDOT with the actual construction activities conducted during the previous week, designating location and quantities of materials that were placed.

### 3.5 Nonconforming Work

The QMP shall include procedures to develop and maintain a system to identify, control, remedy and report Nonconforming Work, including Nonconforming Work identified through the issuance of a NCN by CDOT. The Contractor shall remedy Nonconforming Work in accordance with the Approved QMP. The responsibility for review and authority for the disposition of Nonconforming Work shall be defined in the QMP. The Contractor shall document the identification of Nonconforming Work by completing and submitting a NCR to CDOT as soon as reasonably practicable, and in any event within 24 hours, after the Contractor first becomes aware of the Nonconforming Work. Each NCR shall include:

1. Identification of Nonconforming Work, including tagging work products;
2. Evaluation of the Nonconforming Work, including the cause thereof;
3. Recommendation for “reject” or “remedy” disposition (including, in the case of a “remedy” disposition, details of the recommended Nonconforming Work Remedy);
4. Schedule for completion of any applicable Nonconforming Work Remedy;
5. Signature lines for CDOT’s Approval of (i) the disposition and (ii) in the case of a “remedy” disposition, the recommended Nonconforming Work Remedy, including the Schedule for completion thereof. The Contractor shall not commence with any Nonconforming Work Remedy or progress beyond Nonconforming Work until CDOT has provided its Approval;
6. If applicable:
  - a. a Corrective Action Plan detailing the proposed Corrective Action in relation to such Nonconforming Work and to prevent recurrence;
  - b. responsibility for accomplishing Corrective Action through a Corrective Action Plan;
  - c. Schedule for completion of Corrective Action;
7. Signature line for CDOT’s Approval of any applicable Corrective Action Plan;
8. Signature lines for the design or construction IQC Manager verifying that any applicable Nonconforming Work Remedy has been completed;
9. Signature lines for the design or construction IQC Manager verifying that any applicable Corrective Action has been completed in accordance with the Corrective Action Plan; provided that:
  - a. the initial NCR submitted to CDOT pursuant to this Section-0 in respect of any Nonconforming Work shall only be required to include the information required by this Section 0-1-3.5, Item 1 above and, if known at the time of submission of the NCR, Section 3.5, Item 2 above-0-2; and

- b. the information required by this Sections 3.5, Item -2 above0-2 (if not included in such initial NCR) and Items 3 through 9 shall only be required to be included in the updated NCR submitted to CDOT pursuant to Section 3.5-0 of this Section 3.

Within seven Days after the issuance by the Contractor of any initial NCR pursuant to Section 3.5.1 of this Section 3, the Contractor shall submit an updated NCR to CDOT for Approval that recommends, as appropriate, a “reject” or “remedy” disposition for the Nonconforming Work and, in the case of a recommended “remedy” disposition, should identify the Nonconforming Work Remedy it proposes, together with the other information required to be included in such updated NCR in accordance with proviso B to Section 3.5.1 of this Section 3.

Prior to the submittal of any updated NCR to CDOT, the Contractor’s Design Build Project Manager or designee as Approved by CDOT shall approve (a) the recommended disposition specified in such NCR and (b) in the case of a “remedy” disposition, the recommended Nonconforming Work Remedy.

The Contractor’s Design Build Quality Manager shall document the completion of any Nonconforming Work Remedy and, if applicable, any Corrective Action, once accomplished, and promptly notify CDOT so that CDOT can perform its verification.

The QMP shall include 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.

For verification and acceptance purposes, CDOT will perform assessment of the Work. These efforts do not relieve the Contractor of responsibility for checking all Work. CDOT will forward all assessment reports and NCNs to the Contractor. NCNs may be:

1. Level 1, identifying Nonconforming Work that represents an immediate or imminent health or safety hazard, nuisance or other similar immediate or imminent risk to Users or workers or an immediate or imminent risk of structural failure, damage to a third party’s property or equipment or damage to the Environment; or
2. Level 2, identifying any other category of Nonconforming Work.

Within 24 hours of the issuance of a Level 1 NCN and within seven Days of issuance of a Level 2 NCN by CDOT, the Contractor shall respond to CDOT by submitting an NCR (which shall include all information specified in Section 3.5s, Items-0.41 through 9-9 of this Section 3 in respect of the Nonconforming Work identified in the NCN) for Approval and entering this NCR number in the quality management system. CDOT shall provide quality management system user accounts and training for this purpose. The Contractor shall describe in the QMP its approach and methodology for resolving and responding to any NCNs issued by CDOT.

### 3.5.1 Corrective and Preventative Action

The QMP shall describe corrective and preventative action (“Corrective Action”) procedures that the Contractor shall use to identify and improve processes and remedy issues that produce, or may produce, systemic Nonconforming Work. The Contractor’s Corrective 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 Action efforts based upon the level of risk to the quality of the Work;
4. Controls to ensure that effective Corrective Action is taken when the need is identified; and
5. Methods to implement and record changes in procedures resulting from any Corrective Action.

If systemic Nonconforming Work is identified by the Contractor or identified by CDOT by the issuance of a corrective action request (CAR) notice to the Contractor, the Contractor shall submit a Corrective Action Plan to CDOT.

## 3.6 Punch List Work

The Contractor shall develop Punch Lists and Punch List logs recording information required to demonstrate the Contractor’s compliance with Section 3.6.1 and Book 1 Section 20. All Punch Lists and Punch List logs shall be completed by PC and IQC personnel. CDOT and other affected agencies shall be invited by the Contractor to attend walks of the Work to include items on Punch Lists. The Contractor shall provide all Punch Lists and Punch List logs for Approval to CDOT prior to Project Completion.

### 3.6.1 Punch List Process

The Contractor’s QMP shall include a process for the development of Punch Lists and Punch List logs, closure of Punch List items, and shall be in conformance with Book 1 Section 20. At a minimum, the Punch List Process shall include the following:

1. Procedure and roles in developing the Punch Lists for the project, including schedule for identifying Punch List items and CDOT involvement in the process.
2. Procedure to inspect, verify, and document that items on the Punch Lists have been corrected or completed, including roles of PC and IQC staff.
3. Upon receiving the Punch Lists and Punch List logs from the Contractor for Approval, CDOT shall have 14 Days to Approve the contents of such Punch List or dispute or reject the inclusion or omission of any item on such Punch List. In the event that CDOT determines that the Punch List is incomplete or inaccurate, the Contractor shall promptly resolve those items identified by

CDOT and resubmit the Punch List and Punch List logs for CDOT Approval. This process shall continue until such time that CDOT has Approved the Punch List and Punch List logs.

4. Process for the Contractor to provide CDOT with regular written updates on the Punch List status.

## 3.7 Quality Assurance Oversight

### 3.7.1 CDOT Quality Oversight

CDOT retains the responsibility for acceptance of the Work as required in Title 23, Code of Federal Regulations, Part 637.

CDOT will periodically audit the Contractor's Quality Management activities, including conducting independent verification sampling and testing to assess the Contractor's compliance with the requirements of the Contract. CDOT reviews of sampled Work for Contract compliance are defined as verification reviews. The four types of CDOT verification reviews are:

1. Design verification reviews: CDOT will perform design verification reviews on the products of design (drawings, specifications, and other design deliverables) on an ongoing basis during the Work. The Contractor shall submit documents for design verification reviews to CDOT for Acceptance a minimum of five Working Days in advance of review meeting.
2. Construction verification Inspections: CDOT will perform construction verification inspections on construction activities.
3. Construction verification Testing: CDOT will perform sampling and Testing of materials to validate the Contractor IQC testing program. Verification Test results will be stored in the quality management system.
4. Process Audits: CDOT will perform process audits on the implementation of all Contractor Work activities, excluding design and construction. Such activities may include the requirements of the Contract, such as public information, transportation management, environmental compliance, safety, project management processes, and meeting the requirements of the Approved QMP.

Verification reviews will entail the collection and documentation of objective evidence to determine whether the requirements of the Contract have been met. The results of CDOT verification reviews will be recorded by CDOT and will be documented within CDOT's quality management system. Any NCNs identified by CDOT require a response within the quality management system.

CDOT will provide the Contractor access to CDOT's quality management system to review and respond to observations made during CDOT Quality Oversight activities. Contractor is required to utilize CDOT's quality management system to record all material test quality records, and to respond to CDOT generated observations. Contractor is given the option of either directly entering all IQC observations and level 1 and level 2 material test results, as described in CDOT *Field Materials Manual*, into



CDOT's quality management system or providing CDOT with data collected during IQC efforts in an electronic format compatible for batch upload into CDOT's quality management system. CDOT generated observations will be identified either as conforming or nonconforming to related requirements of the Contract. CDOT observations will be presented to Contractor through CDOT Quality Oversight Verification Reports. A construction Nonconformance Report will be closed by CDOT upon the verification of a resolution of the issue Approved by CDOT.

### **3.7.2 CDOT Owner Verification Testing**

CDOT will perform periodic verification tests to ensure that the Contractor's materials meet the requirements of the Contract. CDOT will enter verification test results in the quality management system. CDOT will perform a statistical analysis to ensure that the Contractor's IQC test results correlate statistically with CDOT verification test results and meet the requirements of the Contract. If CDOT determines that the compared test results do not correlate, CDOT will follow procedures outlined in CDOT *Field Materials Manual* for Non-Validation and Status of Material Quality.

### **3.7.3 Independent Assurance**

CDOT will perform Independent Assurance tests to ensure that:

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

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 IQC tests and CDOT verification test results.

IAT will be on a system basis and not a project basis.

### **3.7.4 Governmental Authority Inspections**

Governmental Authorities shall have the right to inspect the Work, provided that the Governmental Authority has jurisdiction over the Work and as required by Law.

## **3.8 Deliverable Requirements**

### **3.8.1 Quality Management Plan**

The Contractor shall submit the Stage 1 QMP to CDOT for Approval as an NTP1 Condition. The Stage 2 QMP for all remaining Work must have CDOT's Approval as an NTP2 Condition. NTP2 will not be issued until the Stage 2 QMP has been Approved by CDOT.

### 3.8.2 Design Deliverables

The Contractor shall submit all design deliverables to CDOT as outlined in Section 3.9.

The Contractor shall identify on its Project Schedules when RFC Documents and As-Built documents will be submitted to CDOT. The schedule shall also reflect changes to the Work as a result of revisions to RFC Documents having been made.

The Contractor shall provide one set of electronic files in \*.pdf format of the design deliverables to CDOT. The Contractor shall provide electronic files in MicroStation format of the design deliverables upon request by CDOT, unless noted otherwise in the Contract Documents. As-Built documents shall show all changes. All changes shall be noted using CADD. Hand-drawn changes are not permitted.

The design deliverables shall be delivered to CDOT indexed and clearly marked to indicate the date of issue and stage of development (e.g., RFC Documents). All design deliverables shall include a title block, consistent with the standard Work 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. The names of the Contractor, sub-consultants, subcontractors, suppliers, and manufacturers, as applicable; and
4. Subject identification by Contractor drawing or Contract reference.

All design deliverables shall be sealed by the Contractor's engineer consistent with Law. 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 his or her review and approval.

If a design deliverable requires review approval from a 3<sup>rd</sup> Party, Government Authority or permitting authority, the Contractor shall obtain such approval pursuant to the Contract.

Specifications or CDOT Standard Special Provisions applicable to a design deliverable shall be submitted with the design deliverable.

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.

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. Project files shall be organized and submitted in accordance with CDOT's ProjectWise format.
2. The Contractor shall prepare As-Builts for the Work that shall include, but not be limited to, the following:
  - a. Title sheet;
  - b. Index;
  - c. Standard Plan List;
  - d. Roadway design data, as necessary;
  - e. General notes;
  - f. Pavement details, as necessary;
  - g. Drainage details, as necessary;
  - h. Structural plans and details;
  - i. Electrical plans and details;
  - j. Domestic Water Supply piping plans and details;
  - k. Geotechnical plans, as necessary;
  - l. Environmental mitigation, as necessary;
  - m. Permanent signing plans, as necessary;
  - n. Aesthetic elements;
  - o. Tunnel typical sections;
  - p. Tunnel geometric layout plans;
  - q. Tunnel plan;
  - r. Tunnel profile, as necessary;
  - s. Detour construction and phasing plans, as necessary;
  - t. Detour construction and phasing profiles, as necessary;
  - u. Pavement plans, as necessary;
  - v. Drainage plan, as necessary;
  - w. Drainage profiles, as necessary;
  - x. Pavement marking plans, as necessary;
  - y. Utility plans, as necessary;
  - z. Right-of-Way plans, for Contractor acquisitions, as necessary;
  - aa. Right-of-Way monumentation plans, as necessary;
  - bb. ITS, plans, as necessary;
  - cc. ITS/SCADA Communication Network plans, as necessary;

- dd. Landscape/seeding plans, as necessary;
  - ee. Grading plans, as necessary;
  - ff. Lighting plans, as necessary;
  - ~~gg. Generator plans and details;~~
  - ~~hh.gg.~~ Water Treatment Plant plans and details;
  - ~~ii.hh.~~ Roadway cross sections, as necessary;
  - ~~jj.ii.~~ Estimated material quantities;
  - ~~kk.jj.~~ Other details, as needed; and
  - ~~ll.kk.~~ Specifications
3. The Contractor shall provide one set each of electronic files of Utility As-Built documents to CDOT and to the respective Utility Owner for Utility Work constructed by the Contractor, within 90 Calendar Days after the Utility Owner has accepted the Utility Work, as applicable. 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 ROW limits. Additionally, the Contractor shall obtain from each Utility Owner performing its own Utility Relocations Utility As-Built documents for such Utility Relocations showing the foregoing information, and shall deliver one set of electronic files of such documents to CDOT. The Contractor shall show this information on the As-Built documents. All As-Built documents electronic files shall be submitted in MicroStation and \*.pdf format, or other formats as accepted by the Utility Owner;
  4. CADD files shall be in accordance with the appropriate CDOT standards. All CADD files shall be documented in a tabular format describing the path, file name, and description.
  5. The structure of the reference drawings, Contract Drawings, and CADD files are recommended as a guideline for file setup.

### 3.8.3 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.

### 3.8.4 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).

### 3.8.5 Product Data

The Contractor shall submit to CDOT for Acceptance one electronic copy of all manufacturers' warranties, guarantees, instruction sheets, parts lists, and other product data within 20 Working Days after installation of the items to which they relate, and in any event prior to Project Completion. The Contractor shall ensure that the product data cited in this Section is organized and indexed in a manner that allows easy retrieval of information. The Contractor shall maintain proper records of product data.

### 3.9 Deliverables

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

Table 3-1: Deliverables by the Contractor

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
Evidence of ASQ certification of IQCM and CPCM	Information	Prior to the issuance of NTP2
Task Force Meeting Minutes	Acceptance	5 Working Days after meeting
Other Meeting Minutes (as defined in QMP)	Acceptance	5 Working Days after meeting
Design Progress Meeting Minutes	Acceptance	5 Working Days after meeting
Preliminary (30% level) plan package	Acceptance	As defined in Contract Schedule
Final (100% level) plan package	Acceptance	As defined in Contract Schedule
Released for Construction Documents	Acceptance	As defined in Contract Schedule
Revisions to Released for Construction Documents	Acceptance	As defined in the Contract Schedule
As-Built Documents	Acceptance	As defined in the Contract Schedule

Deliverable	Review, Acceptance, or Approval	Schedule
Electronic 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	Acceptance	Prior to Final Acceptance
Quality Manager reports the status of the Work's quality	Information	Monthly
IQC test measurements and test results	Information	Within 24 hours following inspection or test completion
The MTIP shall include a summary of activity-specific Material quantities to document that the minimum sampling, testing, and inspection requirements have been met.	Acceptance	Monthly
Nonconformance Report	Approval	As required by Section 3.5
Nonconforming Work log	Information	Weekly, or as otherwise Approved by the Department
Corrective Action Plan	Approval	As required by Section 3.5
Punch Lists and Punch List Logs	Approval	As required by Section 3.6 and Book 1