# ATTACHMENT 3-1

# QUALITY MANAGEMENT PLAN REQUIREMENTS

Design-Builder shall develop, implement, and maintain a comprehensive Quality Management Plan (QMP) that is consistent with and expands upon the preliminary Quality Management Plan submitted with the Proposal. The QMP shall be organized following the format outlined in this Attachment 3-1 and shall address the information required below and the requirements of Section 3 of the Technical Provisions. The QMP shall contain the following five sections as outlined and described below:

Section 1 – Introduction

Section 2 – Quality Control Organization

Section 3 – Document Management Procedures

Section 4 – Design Quality Control Procedures

Section 5 – Construction Quality Control Procedures

## Section 1 – Introduction

The Quality Management Plan shall contain a complete description of the quality policies and objectives that Design-Builder will implement throughout its organization. The policy shall demonstrate Design-Builder senior management's commitment to implement and continually improve the quality management system for the Work. Section 1 shall briefly describe the requirements and procedures for each of the following:

- Project Work Packages
- Project Quality Assurance Requirements
- Quality Management Plan (QMP)
- QMP Approval and Revisions
- Quality Control Plans
- Fabricator and Manufacturer Quality System Manuals

# Section 2 – Quality Control Organization

## 2.1 Quality Control Administrator

- The Quality Control (QC) Administrator is considered one of the Project's key personnel. The QC Administrator shall be responsible for overall management of the QC System as established in the Quality Management Plan. The QC Administrator shall be a Registered Professional Engineer currently licensed in the State of NH and have a minimum of 10 years' experience in transportation design or construction, unless otherwise approved in writing by NHDOT at their sole discretion. The QC Administrator shall report directly to the Design-Builder's Executive Management and coordinate all Project QC issues directly with NHDOT. The specific duties of the QC Administrator shall be outlined in the QMP.

- The Design-Builder shall not replace the QC Administrator without prior written approval by NHDOT. Design Builder to provide resume of proposed replacement for NHDOT review. The Design-Builder's request to replace the QC Administrator shall name a proposed replacement manager who shall be available full-time within 15 Days of NHDOT approval. No work shall be performed without an active QC Administrator.

## 2.2 Design Quality Control Manager

- The Design Quality Control (QC) Manager shall be responsible for implementation of all Design QC procedures and activities as established in the Quality Management Plan. The Design QC Manager shall be a Professional Engineer (minimum 10 years' experience in highway and/or bridge design, unless otherwise approved in writing by NHDOT at their sole discretion), Registered in the State of NH and shall report directly to the Design-Builder's QC Administrator. The specific duties of the Design QC Manager shall be outlined in the QMP.

## 2.3 Construction Quality Control Manager

- The Construction Quality Control (QC) Manager shall be responsible for implementation of all Construction QC procedures and activities as established in the Quality Management Plan. The Construction QC Manager shall be a Civil Engineer (certified as a NETTCP QA Technologist) and shall report directly to the Design-Builder's QC Administrator. The specific duties of the Construction QC Manager shall be outlined in the QMP.

## 2.4 Project Design and Construction Personnel Role in Quality Control

- All Design and Construction "Production Personnel" (i.e. staff performing design and construction work activity) on the Project, including the Environmental Permitting Manager, Design Manager, Construction Manager, Construction Superintendent(s), and all personnel working under their direction, shall have the "up front" responsibility for ensuring the quality of their work. These staff are expected to apply QC "self-checks" or "self-inspection" throughout the process of work production.
- All Design and Construction Production Personnel shall receive periodic Quality Control training under the direction of the QC Administrator and QC Staff.
- Formal Quality Control checks will be performed independent of Design Production Personnel by the Design QC staff and formal QC inspection and testing will be performed independent of Construction Production Personnel by the Construction QC staff throughout design and construction.

## 2.5 Quality Control Organization Chart

- An Organization Chart shall be provided in the QMP which clearly shows the respective QC responsibilities and relationship between the formal QC staff and all Design and Construction Production Personnel on the Project, including the Environmental Permitting Manager, Design Manager, Construction Manager, Construction Superintendent(s), and all personnel working under their direction.
- The Quality Control organizational structure, including the identification of full-time Design QC Team and Construction QC Team employees with specific Quality Control responsibilities shall be fully described and included in the QC Organizational Chart. The chart shall show lines of authority and reporting responsibilities. The persons and organizations performing Quality Control functions shall have sufficient authority and organizational freedom to identify quality problems, and to initiate, recommend, provide and verify the implementation of solutions. Persons performing Quality Control functions shall be at an organizational level that ensures that they are not influenced by the potential impact of implementation of the Quality Management Plan requirements on the Project Schedule, performance or cost.

# Section 3 – Document Management Procedures

- The Quality Control procedures for the DB Entity's Design plans, specifications, reports, calculations and other Construction Documents shall be organized by engineering discipline (structural, civil, utilities, etc.). These procedures shall specify measures to ensure that appropriate quality requirements are specified and included in Design Documents and to control deviations from such requirements.
- At a minimum, the following QC procedures shall be established and monitored by the QC staff:
  - An electronic project filing system (electronic folders).
  - Standard file naming convention (for all types of documents).
  - Electronic file revisions and redline markup standards.
  - Email standards, protocols, and filing system.

# Section 4 – Design Quality Control Procedures

## 4.1 Design Quality Control Organization

- The Design QC Team will report and therefore be directly responsible to the DB Entity and work independently from the Design Production Personnel.
- The Design QC Team members assigned the responsibility for Quality Control Checking of the design shall not be directly involved with the design of the item, segment, or phase being checked.
- A chart shall be included showing the relationship of the Design QC Team and other Project staff (including the Construction QC Team).

## 4.2 Quality Control Activities By Design Production Personnel

- The Project Design Production Personnel role in QC “self-check” activities shall be fully described in the QMP. At a minimum, the following Quality Control activities by the Design Production Personnel shall be included:
  - Discipline Coordination Reviews.
  - Independent Technical Reviews.
  - Constructability Reviews.

## 4.3 Quality Control Activities By Design QC Team

- The Design Quality Control Team roles and activities shall be fully described in the QMP. At a minimum, procedures for the following Quality Control activities by the Design QC Team shall be included:
    - Review Comment Procedures and Forms.
    - Validating and approving Computer Software.
    - Review of Studies, Reports and other Design Documents.
    - Detail Checking Report Forms.
    - Detail Checking of Calculations (including Computer Program Input).
    - Detail Checking of Plans.
    - Detail Checking of Specifications & Special Provisions.
    - Design QC Team Review of 80% Plans and Specifications.
    - Design QC Team Review of Final Plans and Specifications.
    - Procedures for formal documentation that the Design QC Team has reviewed all reports, calculations, plans, specifications, and other Construction Documents and finds that the documents meet the quality standards in the QMP.

## 4.4 Coordination Activities With Construction

- The roles and activities requiring coordination between Design Production Personnel and Construction Production Personnel and Construction QC staff shall be fully described in the QMP. At a minimum, the following Quality Control activities shall be included:
    - Review of Shop Drawings (by Design staff and by Design QC Team).
    - Requests for Information.
    - Notice of Design Change.
    - Field Design Changes.
    - Design Dispute Resolution Procedures (between Construction and Design Staff).

# Section 5 – Construction Quality Control Procedures

## 5.1 Construction Quality Control Organization

- The Construction QC Team will report and therefore be directly responsible to the DB Entity and work independently from the Construction "Production Personnel".
- The Construction QC Team members assigned the responsibility for Quality Control inspection and testing of the construction Work Items shall not be directly involved with the "production & placement" activities for the item, segment, or phase being inspected.
- A chart shall be included showing the relationship of the Construction QC Team and other Project staff (including the Design QC Team).

## 5.2 Quality Control Activities By Construction Production Personnel

- The Project Construction Production Personnel role in QC "self-check" activities shall be fully described in the QMP. At a minimum, the following Quality Control activities by the Construction Production Personnel shall be included:
  - Work Item Coordination Reviews.
  - Pre-production & Pre-placement Checks.
  - Self-Inspection during Work Item production & placement.

## 5.3 Quality Control Activities By Construction QC Team

- The Construction Quality Control Team roles and activities shall be fully described in the QMP. At a minimum, procedures for the following Quality Control activities by the Construction QC Team shall be included:
  - Construction QC Team Review of 80% Plans and Specifications.
  - Construction QC Team Review of Final Plans and Specifications.
  - Procedures for formal documentation that the Construction QC Team has reviewed all other Construction Documents and finds that the documents meet the quality standards in the QMP.
  - Development & review of QC Inspection and Testing Schedules to be included in the QMP and Quality Control Plans.
  - Development & review of standard QC Operating Documents, including; Inspection Report Forms, Testing Report Forms, and QC Record Books.
  - Development and review of Quality Control Plans required for major Work Items.
  - Performing QC Inspection at production facilities (i.e. plants) and at field placement.
  - Performing QC Sampling &Testing at production facilities (i.e. plants) and at field

placement.

- Documenting QC Inspection results and QC Testing results.
- Maintaining QC Record Books and QC Database.
- Performing analysis of QC Inspection Data and QC Testing Data.
- Providing regular feedback to Construction Production Personnel on results of QC Inspection and Testing Data.
- Addressing opportunities for improvement by identifying the root cause(s) of a problem and determining modification(s) to work processes to improve the delivery of services and construction activities. Ensuring appropriate process adjustments and corrective actions are implemented when determined necessary to provide the required level of quality.

## 5.4 Quality Control of Project Produced Materials

- **Applicable Work Items**
  - The QMP shall address the three principal materials categories (as defined in AASHTO R 38). Identify all DOT standard Work Items to be addressed under the category of Project Produced Materials.

- **Contractor Quality Control Plan(s)**
  - Identify Project Work Items requiring QC Plans.
  - Outline the minimum information required in QC Plans using the NETTCP “Model Quality Control Plan” (October 2008) as a standard template.

- **Quality Control Inspection Schedules**
  - QC inspection shall be provided for the following Inspection Components:
    - Equipment
    - Environmental Conditions
    - Materials
    - Workmanship
  - Identify the specific Inspection Attributes to be inspected for:
    - Production Facilities
    - Project Site
  - Lot and Sublot sizes shall be established for each Inspection Attribute, unless already specified by DOT. Lot sizes shall not exceed 20 to 30 Sublots. Sublot sizes shall be no greater than the minimum frequencies for inspection contained in the DOT Construction Manual.
  - Provide the Lot size and Sublot size for each Inspection Attribute to be inspected.

- **Quality Control Sampling and Testing Schedules**
  - QC Sampling - QC sampling shall include:
    - Random Sampling (per ASTM D 3665)

- Selective Sampling

- QC Testing - Identify the specific Quality Characteristics to be tested for:
  - Production Facilities
  - Project Site
- Lot and Sublot sizes shall be established for each Quality Characteristic, unless already specified by DOT. Lot sizes shall not exceed 20 to 30 Sublots. Sublot sizes shall be no greater than the minimum frequencies for testing contained in the DOT Materials Manual.
- Provide the Lot size and Sublot size for each Quality Characteristic to be tested.

- **Quality Control Documentation**
  - Standard QC Report Forms and Record Books shall be established for inspection, sampling, and testing of all Work Items. NETTCP standard Test Report Forms (TRFs) and Inspection Report Forms (IRFs) shall be used to document all QC inspection, sampling, and testing results.
  - QC Inspection Records – The following shall be included in the QMP:
    - Inspection Report Forms (IRFs)
  - QC Sampling & Testing Records – The following shall be included:
    - Random Sampling Forms
    - Test Report Forms (TRFs)
  - QC Record Books – Standard formats for the following shall be included:
    - Production Facility QC Record Books
    - Project Site QC Record Books

- **Quality Control Data Analysis**
  - Identify the minimum requirements for analysis of QC Inspection and Testing data for all Work Items.
    - Identify the specific Conformance Measure(s) to be applied to QC Inspection data.
    - Identify the specific Quality Measure(s) and Quality Limits to be applied to QC Testing data.
  - Identify QC Tools for monitoring quality during production and placement, including:
    - Control Charts
    - Running Quality Level (e.g. Quality Level Analysis)

## 5.5 Quality Control of Fabricated Structural Materials

- **Applicable Work Items**
  - Identify all DOT standard Work Items to be addressed under the category of Fabricated Structural Materials (as defined in AASHTO R 38).

- **Fabricator Quality System Manual**
  - o All Fabricators shall be required to have a Quality System Manual (QSM).
  - o Outline the minimum information required in each Fabricator QSM using the QSM format and outline contained in AASHTO R 38 or similar format and outline acceptable to DOT.

- **Contractor Quality Control Plan(s)**
  - o Identify Project Work Items requiring QC Plans
  - o Outline the minimum information required in QC Plans using the NETTCP "Model Quality Control Plan" (October 2008) as a standard template.

- **Quality Control Inspection Schedules**
  - o (Same requirements as Section 5.4 above).

- **Quality Control Sampling and Testing Schedules**
  - o (Same requirements as Section 5.4 above).

- **Quality Control Documentation**
  - o (Same requirements as Section 5.4 above).

- **Quality Control Data Analysis**
  - o (Same requirements as Section 5.4 above).

### 5.6 Quality Control of Standard Manufactured Materials

- **Applicable Work Items**
  - o Identify all DOT standard Work Items to be addressed under the category of Standard Manufactured Materials (defined in AASHTO R-38) or similar format and outline acceptable to DOT.

- **Manufacturer Quality System Manual**
  - o All Manufacturers shall be required to have a Quality System Manual.
  - o Outline the information required in each Manufacturer QSM using the QSM format and outline contained in AASHTO R 38 or similar format and outline acceptable to DOT.

- **Project Site QC Inspection and Testing**
  - o All Standard Manufactured Materials shall be delivered to the Project site

with a standard Certificate of Compliance (COC) accompanied by a copy of all Manufacturer QC inspection and test results for the corresponding Lot of material, in accordance with AASHTO R 38.

- Identify requirements for random (per D 3665) Project site QC inspection and testing of each Lot of Standard Manufactured Material Work Item to verify the Manufacturer's COC data.

- **Quality Control Documentation**
  - All Manufacturer COC's shall be retained in Project Site QC Record Books.
  - (Same requirements as Section 5.4 Above).

- **Quality Control Data Analysis**
  - Identify the minimum requirements for analysis of all Project site QC Inspection and Testing data.
  - Identify the specific Conformance Measure(s) to be applied to QC Inspection data.
  - Identify the specific Quality Measure(s) and Quality Limits to be applied to QC Testing data.
  - Identify QC Tools for monitoring quality during production and placement, including:
    - Control Charts
    - Running Quality Level (e.g. Quality Level Analysis)

## 5.7 Quality Control Laboratory Accreditation & Qualification

- **QC Laboratories Testing Project Produced Materials**
  - All laboratories performing QC testing of Project Produced Materials shall be qualified through one of the following:
    - AASHTO Accreditation Program (AAP)
    - NETTCP Laboratory Certification Program

- **QC Laboratories Testing Fabricated Structural Materials**
  - All laboratories performing QC testing of Fabricated Structural Materials shall be qualified to perform the specific QC testing required for the fabricated items through an appropriate Laboratory Accreditation Program or Laboratory Qualification Program, in accordance with the requirements contained in AASHTO R 38.

- **QC Laboratories Testing Standard Manufactured Materials**
  - All laboratories performing QC testing of Standard Manufactured Materials shall be qualified to perform the specific QC testing required for the manufactured items through an appropriate Laboratory Accreditation Program or Laboratory

Qualification Program, in accordance with the requirements contained in AASHTO R 38.

## 5.8 Quality Control Personnel Qualification/Certification

- **QC Personnel Inspecting or Testing Project Produced Materials**
  - All QC personnel performing inspection, sampling, or testing of Project Produced Materials shall be certified through the NETTCP. QC personnel shall possess the specific certifications directly relevant for each of the following Work Items they are responsible for inspecting or testing:
    - Earthwork
    - Subbase or Base Courses
    - Geotechnical Items
    - Hot Mix Asphalt (HMA)
    - Portland Cement Concrete (PCC)

- **QC Personnel Inspecting or Testing Fabricated Structural Materials**
  - All QC personnel performing inspection, sampling, or testing of Fabricated Structural Materials shall be certified through applicable national or regional certification programs. QC personnel shall possess the specific certifications directly relevant for each of the following Work Items they are responsible for inspecting or testing:
    - Fabricated Structural Steel & Coatings (AISC, AWS, NACE)
    - Precast/Prestressed Concrete (PCI Level II)

- **QC Personnel Inspecting or Testing Standard Manufactured Materials**
  - All QC personnel performing inspection, sampling, or testing of Standard Manufactured Materials shall be qualified through appropriate QC personnel qualification or certification programs in accordance with the requirements contained in AASHTO R 38.