

## 124 QA/QC Management Plan

### 124.1 General

Quality Assurance (QA) and Quality Control (QC) are two processes used to ensure that deliverables are complete, orderly, correct, and appropriate for the intended purposes. The quality of the deliverable must meet or exceed industry standards; i.e., "Due Diligence" ("Due or Ordinary Care").

Quality Control (QC) is the process of checking, reviewing, and revising deliverables to comply with Department requirements. Quality Assurance (QA) is enforcing and verifying that quality control procedures have been established and performed.

This chapter describes the Department's QA/QC Management Plan for the development of deliverables. A deliverable is any professional service document (e.g., Plans, Specifications, Reports) that is produced for the Department.

Modification for Non-Conventional Projects:

Delete **FDM 124.1** and insert the following:

### 124.1 General

See the RFP for Quality Management Plan (QMP) requirements which describes the Quality Control (QC) procedures to be utilized to verify, independently check, and review all design drawings, specifications, and other contract documents. The QMP must establish a Quality Assurance (QA) program to confirm that the Quality Control procedures are followed.

The Department reserves the right to conduct an audit of the Design Build Firm's QMP process to ensure the submitted plan for the project is being properly executed. All documentation for QA/QC (e.g., check prints, design calculations) must be kept on file until construction of the project is complete at a minimum.

## 124.2 Quality Control Plan

A Quality Control Plan establishes the review procedures that are to be performed on each deliverable. The Quality Control Plan includes the following elements:

- QA/QC Staffing Plan
- Review procedures for each deliverable type (e.g., reports, plans, model)
- Certificate of Compliance

A project-specific Quality Control Plan is not required for Department (in-house) design projects; however, these projects must follow the procedures outlined in this chapter.

Consultant design projects must either:

- (1) Develop a project-specific Quality Control Plan acceptable to the Department. The Quality Control Plan is completed and accepted before any design efforts begin; typically, within 20 days after Notice to Proceed.
- (2) Adopt the Quality Control Plan requirements outlined in **FDM 124** by submitting a declaration email to the Department PM. Attach the proposed QA/QC Staffing Plan to the declaration email. With this option, the prime consultant is responsible for ensuring that subconsultants also adhere to the procedures outlined in this chapter.

### 124.2.1 QA/QC Staffing Plan

The QA/QC Staffing Plan contains a list of required deliverables and associated discipline area. The plan must identify the following staff:

- Engineer of Record (EOR) (professional that will sign and seal the document)
- Lead Technical Professional
- Quality Control (QC) Reviewer
- Quality Assurance (QA) Manager

Include the above information for the entire design team; i.e., include information for Geotechnical, Landscaping, Survey and Mapping, Environmental, and Utility staff.

The QC Reviewer must not be involved in the development of the deliverable. Assigned staff are to be experienced, qualified and professionally licensed.

The Lead Technical Professional is the professional responsible for the development of the deliverable, which is often the Engineer of Record.

For consultant design projects, provide the Department PM with an updated staffing plan whenever staffing changes are necessary.

An example of a QA/QC Staffing Plan is shown in **Table 124.2.1**.

**Table 124.2.1 Example QA/QC Staffing Plan**

<b>Element/Task</b>	<b>Deliverable</b>	<b>Lead Tech. Professional</b>	<b>QC Reviewer</b>
<b><i>Project Management (PM: Luke S. Walker, PE) (QA Manager: Dew Wright, PE)</i></b>			
Project Schedule	Schedule	Luke S. Walker, PE	Dep Abillaba, PE
Quality Assurance	Quality Control Plan	Luke S. Walker, PE	Dep Abillaba, PE
<b><i>Roadway (Rdwy EOR: Luke Walker, PE) (Drg EOR: Flow Fast, PE) (TTCP EOR: Lan Solo, PE)</i></b>			
Variations/Exceptions	Sidewalk Variation	Luke S. Walker, PE	Dep Abillaba, PE
Typical Section	Typical Section Package	Luke S. Walker, PE	Dep Abillaba, PE
Pavement Design	Pavement Design Package	Luke S. Walker, PE	Dep Abillaba, PE
Project Control	Roadway Plans	Chad Bane, PE	Anna King, PSM
Roadway Design	Roadway Plans	Chad Bane, PE	Dep Abillaba, PE
	3D Corridor Model	Mora d' Minbas, E.I.	Sabrina Ren, PE
Temp Traffic Control	Roadway Plans	Lan Solo, PE	Luke S. Walker, PE
Drainage Design	Roadway Plans	Flow Fast, PE	Dep Abillaba, PE
Quantity Computations	QTDSRD files	Mora d' Minbas, E.I.	Sabrina Ren, PE
	Roadway Plans (SQ shts)	Luke S. Walker, PE	Dep Abillaba, PE
Specifications, TSP	Specifications Package	Luke S. Walker, PE	Dep Abillaba, PE
<b><i>Signing &amp; Pavement Marking (EOR: Tara Full, PE)</i></b>			
Signing Design	S&PM Plans	Tara Full, PE	Luke S. Walker, PE
Pavt Marking Design	S&PM Plans	Tara Full, PE	Luke S. Walker, PE
Quantity Computations	S&PM Plans	Chad Bane, PE	Luke S. Walker, PE
<b><i>Survey and Mapping (SOR: Anna King, PSM)</i></b>			
Design Survey	Survey Files	Anna King, PSM	Bob Afett, PSM
Terr Mobile LiDAR	SURVRD01.dgn file	Anna King, PSM	Bob Afett, PSM

## **124.2.2 Quality Control Review**

This check and back check review process is performed by the applicable design group (in-house design units or consultants) before the deliverable is submitted for the Department's ERC Review. The Quality Control Review may be conducted on either a printed paper copy or a PDF of the deliverable.

A formal and documented Quality Control Review is to be performed on all draft and final Reports, Documents and Plans where the final deliverable is signed and sealed. The project schedule must allocate time to complete this review prior to submittal date; typically, one to three weeks (depending upon complexity of the deliverable).

The deliverable that has completed the Quality Control Review is referred to as the "QC Document". Documents that contain multidisciplinary information must show documentation of all applicable discipline reviews. For a paper review, scan the QC Document to PDF.

For consultant design projects, the QC Document must be included with the submittal of any deliverable in which the final document is to be signed and sealed; e.g., Typical Section Package, Pavement Design Package, Specifications Package, Plans (all phase submittals), Lighting Justification Report.

For all projects, the Department PM must place the QC Document in the project file.

### **124.2.2.1 5-Step Review**

The 5-step review described in this section pertains to a review of a paper print of the QC Document. It is expected that minor differences to the 5-step review process described will occur based on office or business adopted practices; however, each of the five steps must be carried out.

A color scheme other than the one described in this section may be used. Specify the colors used within the QC stamp.

#### **Step 1 – Origination**

The Lead Technical Professional assembles the review document and applies a QC Stamp to the cover of a bound set of documents or to individual sheets, if unbound. The QC Stamp may be digitally generated. An example of a QC Stamp is shown in **Figure 2.4.1**.

The Lead Technical Professional enters a description for the QC Document in the block provided; e.g., Phase II Plans, Draft Typical Section Package. By initialing and dating the Origination block, The Lead Technical Professional affirms that the documents are ready for checking.

**Figure 124.2.1 Example QC Stamp**

QC Stamp		
Submittal:		
Step	By	Date
Origination		
Checked Correct - Yellow Highlight Change - Red Comments		
Concurrence Agree - Green Check No change - Green 'X'		
Changes Made Green Highlight		
Changes Verified Blue Check		

**Step 2 – Checking**

The QC Reviewer checks the QC Document:

- Yellow highlight is used to identify the elements of the document that are deemed to be acceptable. Items not checked are not to be highlighted.
- Red mark is used to identify the elements of the document that are deemed to be in error or are questionable (i.e., provide comments).

Black pen (or similar) is used to perform interim manual calculations or make notes for reference on the document.

By initialing and dating the Checked block, the QC Reviewer affirms the completion of the checking process.

**Step 3 – Concurrence**

The Lead Technical Professional indicates agreement with the suggested change by placing a green check mark by the QC comment. This affirms that this change is to be

made. The Lead Professional indicates disagreement with the suggested change by placing a green “X” mark over the QC comment. This affirms that this change is not to be made. This is done only after the Lead Professional has discussed the comment with the QC Reviewer and they reach this conclusion together. Clarification of comment resolution may be provided near the QC comment using blue ink.

By initialing and dating the Concurrence block, the Lead Professional affirms completion of this Concurrence step.

#### **Step 4 – Changes Made**

The Lead Professional makes the agreed-upon changes and uses green highlight to identify that the change has been made.

By initialing and dating the Changes Made block, the Lead Professional affirms that all agreed-upon changes have been made.

#### **Step 5 – Changes Verified**

The QC Reviewer verifies that comments have been appropriately interpreted and addressed by placing a blue check by the QC comment. The QC Reviewer will coordinate any unresolved issues with the Lead Professional for final resolution, and Step 4 will be repeated when necessary.

By initialing and dating the Changes Verified block, the QC Reviewer affirms that all agreed-upon changes have been verified.

### **124.2.2.2 PDF Review**

When conducting a Quality Control Review within a PDF document, use an electronic comment review, resolution, and documentation process mimicking the 5-Step Review Process. Place the QC Stamp only on the first sheet of the QC Document. **Bluebeam®** offers a collaborative approach to performing digital QC reviews and is recommended for multidiscipline reviews; other software applications may be used that provide similar workflow.

### **124.2.2.3 3D Model Review**

3D model reviews should be conducted and documented by using an electronic comment review, resolution, and documentation process that incorporates the 5-step structure.

Perform a 3D model review as outlined in Chapter 9 of the [CADD Manual](#). As a minimum, a 3D model review should assess the following:

- (1) Geographical Coordinate System is defined in the model(s)/design file
- (2) 3D Baseline/Centerline is displayed in the model(s)
- (3) Referenced 3D model break lines match the 2D planimetric lines
- (4) Completeness of model(s), visually:
  - (a) Gaps along the model
  - (b) Spikes or lips along seams
  - (c) Overlapping components
  - (d) Transition between corridors and templates
  - (e) Transition between varying slope values
  - (f) Transitions at curb ramps and driveway locations
  - (g) Slope harmonization with existing surface
  - (h) Median Crossovers
  - (i) Separator Islands
- (5) Verify Typical Section Elements:
  - (a) Depths (pavement, base, concrete, etc.)
  - (b) Widths (lane, shoulder, sidewalk, etc.)
  - (c) Cross Slope (lane, shoulder, sidewalk, etc.)
- (6) Verify Station Offset Elevation at Critical Locations:
  - (a) EOP at Drainage Nodes
  - (b) Begin / End Taper Transitions
  - (c) PC/PT of curves
- (7) Verify Vertical Clearance
- (8) Clash Detection - Interference Checking
- (9) 3D Deliverable Created:
  - (a) XML files for Corridor Alignments
  - (b) XML files for Existing and Proposed Surfaces (verified against 3D design)
  - (c) Dgn or Dwg files for 2D and 3D lines
  - (d) Icm file for OpenRoads Design Delivery

### **124.2.3 Certificate of Compliance**

For consultant produced deliverables, the firm's designated person for overseeing quality control activities (e.g., Quality Control Officer, Quality Assurance Manager) must review and certify that established quality control procedures have been performed. The purpose of the Certificate of Compliance is to attest that the level of effort used to complete the quality control review adheres to industry standards.

Coordinate requirements for the Certificate of Compliance with the Department PM.

### **124.3 Independent Peer Review**

An independent peer review is supplemental to the Quality Control Review and is performed on selected consultant projects. This review is conducted by an independent team of qualified reviewers on specific design elements or portions of a project. Members of the independent peer review team are not assigned to the same organizational unit that managed and produced the project.

### **124.4 Field Review**

A field review (A.K.A. Plans-in-Hand Review) is supplemental to the Quality Control Review. The review is held at the project site for the purpose of verifying the compatibility of the design with the field conditions encountered during construction. A record of the field review includes the following:

- Date and time.
- List of attendees.
- Documented site conditions and observations; may include marked up plan sheets, photographs or any other method deemed appropriate.

For consultant projects, provide the Department PM with a copy of the review record.