

\$\$Office Name\$\$ Project Engineer's Office
Project Development Quality Management Plan

\$\$PROJECT NAME\$\$

\$\$Date\$\$



Washington State
Department of Transportation

Introduction

This Design Quality Management Plan defines the quality control and quality assurance responsibilities and processes during the development of **\$\$project name\$\$** in the **\$\$ project office\$\$**. In order to deliver high quality work products that are thorough, accurate, and timely, every work product will be thoroughly reviewed, checked, and understood prior to leaving the office.

Quality Vision

Quality is a continual process, beginning with each person carefully double-checking his or her own work. Identifying simple errors early in the project avoids compounding errors and having to make significant corrections later. Consequently, every manager, team lead, engineer, technician, and support staff member is responsible for quality.

Quality delivery is a fundamental expectation.

Quality goals

Below is a list of quality goals for design deliverables that have been established by WSDOT. It is expected the design documents and plans:

- Are complete
- Are technically accurate (the data is right and the math is right)
- Are contextually accurate (the story is right)
- Are readable and legible
- Are as error free as practicable

Definitions

Quality Control (QC) is a collection of those actions, procedures, and methods that are to be routinely employed at the production and administrative levels, **under the jurisdiction of the Project Engineer**, during the development of work products to produce the desired quality professional services. The quality control procedures are to:

- Provide **routine and consistent checks** to confirm data integrity, correctness, and completeness;
- Verify **interdisciplinary recommendations incorporated accurately** in to design.
- Identify and address **errors and omissions**; and
- **Document QC activities** and retain and store quality documents.

Quality Assurance (QA) refers to those actions, procedures, and methods employed at management (APE, PE, PDE, RCE, ARA) levels, under the jurisdiction of the Project Engineer (or Quality Manager), **to observe and ensure prudent quality control procedures are in place and are being carried out**, and the desired results of quality professional services are being achieved in accordance with the QMP. Audits should be performed following the implementation of quality control procedures to verify that design quality objectives are met and to support the effectiveness of the quality control program.

Quality Verification (QV) refers to those actions, **procedures and methods employed at Headquarters Design and Construction**, under the jurisdiction of the State Design/Construction Engineer or designee, to:

- Selectively review final products to ensure a QMP was implemented, the appropriate project development process was followed, and was reflected in the final contract document.

- Perform targeted PS&E reviews on select projects based on current trends in the construction phase related to engineering errors.

Quality Management Roles and Responsibilities

The **\$\$fill-in project name\$\$** will be delivered by **\$\$fill-in PEO, Support Groups, etc.\$\$**

General Roles and Responsibilities:

All project team members are responsible for the following:

- Be familiar with and comply with the Design Quality Management Plan.
- Confirm that the criteria, standards, forms, templates or other project guidelines are appropriate for the work being performed.
- Perform continuous quality checks of their own work including spelling, grammar, mathematics, and presentation clarity.
- Identify any quality issues or deficiencies as they arise.

Every team member in the project office has a responsibility for quality. Roles and responsibilities identified below provide general responsibilities and are not intended to be comprehensive descriptions of the tasks for each of these positions.

Project Engineer

The Project Engineer (PE) shoulders the **chief accountability for the quality of the design deliverables** and is responsible for the QA. The **PE is responsible for the overall development and implementation** of the Design Quality Management Plan and seeing that the appropriate resources are allocated and adequate time is scheduled to perform quality reviews.

Assistant Project Engineer

The Assistant Project Engineer (APE) will provide support and perform functions as delegated by the Project Engineer.

Design Team Leaders

The Design Team Leader is **responsible for planning, scheduling, and performing quality control activities** to ensure the Quality Control Procedures are routinely and effectively implemented for the work being performed by the design team in accordance with the project specific QMP. The Design Team Leader **confirms by continual observation and regular audits** that the design documents have been prepared and checked. The Team Leader will **review and verify the support office deliverables**, data, and information are compliant with project expectations and the recommendations incorporated correctly into the contract. The Design Team Leaders will also keep track of quality control and quality assurance activities and record the status of these activities.

The Design Team Leader for this project is **\$\$fill-in\$\$**.

Designer(s)

The designer is any team member that prepares any planning and/or design document. The documents shall be prepared in a manner conducive to checking and reviewing. The designer coordinates with the checkers and/or reviewers to resolve any conflicts or corrections in the deliverables. The Designer will address or correct comments resulting from the checks and reviews. He/she also participates in the Comment Resolution Meeting, at the discretion of the Team Leader.

The Designer(s) for this project is/are **\$\$fill-in\$\$**.

Checker

The checker is responsible for **checking documents, calculations, or plans independent of the designer** in accordance with the Project Deliverables Quality Control Table. The checker checks in detail all numbers, facts, figures, tables, graphs and other representations included in the document. A Checker will be of equal, or greater, level of expertise compared to the original Designer.

The Checker(s) for this project is/are **\$\$fill-in\$\$**.

Reviewer

The Reviewer is responsible for completing a review in accordance with the Quality Control Procedure for reviewing in his or her specific area of expertise.

The Review(s) for this project is/are **\$\$fill-in\$**. (Generally APE, PE)

Support Groups

The Support Groups are responsible for checking and reviewing their documentation and deliverables in accordance with their established procedures, and verifying that the quality control and quality assurance tasks have been completed prior to submitting to the **\$\$fill-in\$\$** PEO.

Quality Control and Quality Assurance Processes

Quality Control Measures

On a continual basis, engineers and technicians need to conceptually verify and independently double-check their work. In addition to self-performed checks, achieving quality also requires to “get another set of eyes” to check and review the work. Checking and reviewing are defined as follows:

- **Checking** is defined as a peer looking over the details of finished work (a set of calculations, for example) to check for completeness and accuracy. This checker looks to see if the work is correct, using the same assumptions and method originally used without the expertise to judge the methodology or approach or the best solution to a problem.
- **Review** generally refers to a higher level look at the overall approach and solution. Reviews are conducted by someone proficient in the discipline and with the expertise and experience that matches the level of complexity of the work. The reviewer’s goals is to ascertain if the solution is appropriate and to determine if this solution will work. A review of this type is executed prior to major project milestones.

Internal informal checks

Informal quality control checks should take place on a continual basis throughout the design process. These checks typically consist of self-checks and routine interaction with peers and Design Technicians.

Quality Control Checks

The Quality Control checks are formal checks performed within the project office and are intended to verify the technical correctness and accuracy of the deliverable. These checks are intended to check all numbers, facts, figures, tables, graphs and other details included in the plan or document. Internal quality check is a formal review and should be performed on all major deliverables. The following Project Deliverables Quality Control Table (PDQCT) defines the roles and responsibilities for internal QC checks:

Project Deliverable	Designer	PEO QC Responsibility	QC Objective	QC Procedure
Design Documentation	John Smith	Jane Doe	Per DM and DDP requirements	QCP -06
Design Parameters	John Smith	Jane Doe	DM Reference and Calculations.	QCP-06
CADD Basemap	John Smith	Jane Doe	Verification of most current survey information and final design	QCP-03
InRoads DTM & Cross sections	John Smith	Jane Doe	Triangulation Errors and Plan Conflicts	QCP-04
Contract Plans	John Smith	Jane Doe	PPM and consistency	QCP-05
- Roadway Sections	John Smith John Smith	Jane Doe Jane Doe	PPM Consistency	

- Paving Plans - Q-tabs	John Smith	Jane Doe	Calculations	
Contract Specials	John Smith	Jane Doe	Appendix C	QCP-07
Summary of Quantities	John Smith	Jane Doe	Calculations	QCP-02
Working Day Schedule	John Smith	Jane Doe	Production Rates	QCP-02 and QCP-06
Support Group Deliverables	John Smith	Jane Doe	Consistency with PEO plans	QCP-08

Internal quality control processes are intended to provide final documents that are compatible with project requirements, comply with WSDOT procedures and standards, and meet required design criteria prior to leaving the project office for quality reviews or Ad & Award. Quality Control Procedures (QCP) section later in this quality plan is a toolbox of various procedures that will be employed to perform quality control checks.

Project Development Quality Reviews (30/60/90/Ad)

Project Development Quality reviews will be performed to review the suitability and soundness of a deliverable by appropriate region and HQ review members. The project team will perform the following quality reviews during the project development phase of this project:

\$\$\$ fill-in 30% Project Development Quality Review (Scheduled Date)

60% Project Development Quality Review (Scheduled Date)

90% Project Development Quality Review (Scheduled Date)

100% Region Review (Scheduled Date) fill-in\$\$

The Project Development Quality Reviews will be performed only after the formal quality control checks and completion of all the required deliverables identified in the Project Development Deliverable Checklist (PDDC) (Appendix B).

Responding to Review Comments

The \$\$fill-in project team\$\$ will coordinate all PDDC reviews by preparing the review products, compiling comments, and facilitating the resolution of all comments. The review will not be complete until all comments have been addressed and verified that they are correctly reflected in the deliverable being reviewed. The Design Team Leader is responsible for facilitating and verifying all comments are appropriately addressed.

Quality Control Procedures

To accomplish the basic quality control checks and reviews and to substantiate that these efforts are complete and correct, several generalized Quality Control Procedures (QCPs) will be used. These QCPs provide standard, generalized, prescribed methods for the performance of quality control and quality assurance activities. The current list includes the following Quality Control Procedures:

- QCP-01 Checking Engineering Calculations
- QCP-02 Checking Bid Item Quantity Calculations
- QCP-03 Checking CADD Basemap Accuracy
- QCP-04 Checking DTM Accuracy
- QCP-05 Checking Contract Plans
- QCP-06 Checking of Technical Written Documents
- QCP-07 Checking of Special Provisions
- QCP-08 Support Group Deliverable Reviews

QCP-01 Checking Engineering Calculations	
Purpose:	Validate the accuracy of engineering calculations
Scope:	Applies to all engineering calculations performed as part of the project. The calculation check is performed by the Checker prior to the 30%, 60%, and 90% Project Development Quality Review.
Requirements: Perform calculations on standard WSDOT 8-1/2" x 11" calculation sheets that are neat, orderly, and legible or provide hard copy print out of computer inputs and outputs. Include any DM references, formulas, and unit conversions, etc.	
Procedures: For manual engineering calculations use either line by line or independent check method as follows: <i>Line by Line:</i> Check each component of the calculations including arithmetic against any references, plan sheets, formulas, computer programs, and identify any potential errors. <i>Independent Calculations:</i> Perform independent set of calculations and verify against designer's calculations and assumptions. <i>Computer Calculations:</i> Check inputs and verify output meets expectations. For spreadsheets, check input, formulas, and perform spot manual calculations to verify accuracy. <i>Spreadsheets:</i> Check input, formulas, and perform spot manual calculations to verify accuracy. The Designer reviews the identified issues with the checker and rectifies any discrepancies. Any disputes are resolved by the design team leader.	

QCP-02 Checking Bid Item Quantity Calculations	
Purpose:	Validate the accuracy of bid item quantity calculations
Scope:	Applies to all bid item quantity calculations including those prepared by support groups. Check is performed by the Checker prior to the 90% and Region/Ad Project Development Quality Review.
Requirements: Provide a three ring binder with a quantity calculation sheet for each bid item on standard WSDOT 8-1/2" x 11" calculation sheets that are neat, orderly, and legible.	

Procedures:

In addition to procedures identified in QCP-01 for calculation checks, ensure calculations are in accordance with measurement and payment specifications included in the Std. Specs, GSPs, and Special Provisions.

The Designer reviews the identified issues with the checker and rectifies any discrepancies. Any disputes are resolved by the design team leader.

QCP-03 Checking CADD Basemap Accuracy

Purpose: Validate the accuracy of existing features and proposed design features

Scope: Applies to CADD Basemap developed for the project and the check is performed by the Checker prior to the 30%, 60%, and 90% Project Development Quality Review.

Requirements: Provide a CADD basemap file in Microstation that meets the Electronic Engineering Data Standards Manual and the Plans Prep Manual.

Procedures: Check CADD basemap for accuracy against most current survey information and Inroads design information.

The Designer reviews the identified issues with the checker and rectifies any discrepancies. Any disputes are resolved by the design team leader.

QCP-04 Checking DTM Accuracy

Purpose: Validate the accuracy of existing and finished DTM

Scope: Applies to InRoads DTM developed for the project. Check is performed by the Checker prior to the 30%, 60%, and 90% Project Development Quality Review.

Requirements: Provide existing, staged construction, and finished DTMs in InRoads format.

Procedures: Spot check critical existing, construction stages, and finished locations like I/C ramp connections, bridge clearances, I/S tie-ins for DTM elevations against finished cross sections.

The Designer reviews the identified issues with the checker and rectifies any discrepancies. Any disputes are resolved by the design team leader.

QCP-05 Checking Contract Plans

Purpose: Verify Contract Plans conflicts, consistency, formatting, standard plan references, etc. for all disciplines

Scope: Applies to all contract plan sheets

Requirements: Provide a hard copy or electronic PDF of all contract plans. Check is performed by the checker and reviewer prior to 90% and Region/Ad Project Development Quality review. Final review is performed by the Engineer of Record prior to signing the contract plans.

Procedures:

<i>QCP-06 Checking of Technical Documents</i>	
Purpose:	Verify accuracy and completeness of information in technical reports, studies, specifications memoranda and other technical written documents
Scope:	Applies to technical documents prepared for the project eg. Design Documentation Package, Basis of Design, Design Analyses, Quantitative Analyses, Crash Analysis Reports, Intersection Control Analysis, etc.
Requirements: Provide a hard copy or electronic PDF of the technical documents. Check is performed by the Checker and Reviewer prior to the documents submitted for review and approval to region and/or HQ.	
Procedures:	

<i>QCP-07 Checking of Special Provisions</i>	
Purpose:	Validate the special provisions follow the HQ Guidelines for Special Provision Preparation. Verify all required GSPs are included for the specific project, and ensure non-standard items have appropriate special provisions.
Scope:	Applies to contract special provisions. Check is performed by the Checker and Reviewer prior to the 90% Project Development Quality Review Deliverable.
Requirements: Hard Copy or electronic P.doc of the special provisions. Check is performed by the Check and Engineer of Record prior to 90% and Region/Ad Project Deliverable Quality Review.	
Procedures:	

<i>QCP-08 Support Group Deliverable Reviews</i>	
Purpose:	Verify Support Group Deliverables in alignment with the site information provided and consistent with other design elements within the project. Ensure all support group deliverable recommendations are incorporated in the project design and the contract.
Scope:	Applies to all Support Group Deliverables
Requirements: Hard copy or electronic PDF of support group deliverables. Check is performed by Designer and the Reviewer prior to 60%, 90% and Region/Ad Project Development Quality Review.	
Procedures:	

Documentation of design QA/QC procedures

It is very important that the appropriate quality documentation be kept for each of the quality control and quality assurance measures that are done. Retention of quality documents serves several purposes. Quality records demonstrate compliance with the requirements and the effective operation of the quality management system. They provide an appropriate reference for periodic monitoring of the quality measures to verify that the procedures are being done according to the Quality Management Plan. They provide a means for the Team Leader and Project Engineer to keep track of the team's status with regard to the quality procedures.

Retention of Quality Assurance documents

Quality documentation shall be maintained in a legible, readily identifiable and retrievable, manner.

In general, copies of all of the Check Prints, or Review Prints, and other quality documentation should be maintained by the Team Leader.