TRI-COUNTY METROPOLITAN TRANSPORTATION DISTRICT OF OREGON (TRIMET)

Capital Projects Division

Quality Assurance Program Manual

Revision No. 3.2, June 2011

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Summary of Revisions

Rev. No.	Date	Description of Changes
0.0	July 2003	Sample document included as part of SoCo RFP (App 6).
1.0	March 2005	Various sections updated to incorporate initial comments. Document not distributed for general use.
1.1	March 2006	Various sections updated to incorporate additional comments. Document not distributed for general use.
1.2	December 2006	Introduction and Sections 2-8 and 10-15 updated to incorporate additional comments. Document issued as Sample for use in CTC Transit Center and P&R Garage RFP, App H.
2.0	January 2007	Organization Chart and references updated. Document issued for use on South Corridor Project.
2.1	February 2008	Revised Section 2 and Page 6; Upgraded Section 3 to include the TriMet QA/QC Manual for Design; Revised NCR procedure/form. Issued draft document with PMLR PMP as Capital Projects and Facilities Division QA Program Manual.
2.2	November 2008	Revised Division title; Incorporated comments provided by TriMet Staff and PMOC Task Order No.9. Resubmitted draft to PMOC.
3.0	January 2009	Updates incorporated and document issued for general use.
3.1	March 2010	Updates to terminology, procedures and forms. Issued for general use.
3.2	June 2011	Updated Org chart/reporting information, NCR form and overall formatting. Issued for inclusion into the PMLR FFGA submittal.

Table of Contents

Management Commitment Summary Statement

The quality of any federally funded project designed and constructed by the Capital Projects Division of TriMet is the ultimate measure by which the riders and observers will judge the success of the Project.

It is the policy of the Tri-County Metropolitan Transportation District of Oregon (TriMet) that the Project will be planned and constructed with the highest regard for quality. Project management will identify quality objectives, specify quality-related activities to achieve those objectives, and assign responsibilities for implementing those activities.

It is TriMet's intent that quality be a team effort, encompassing all persons and organizations participating in the development of the Project. The entire Project team, in providing management, design, construction, consulting or other services, is responsible for producing quality results appropriate for their respective roles.

Each Project's management, staff, consultants, and contractors, commit to the full and faithful execution of this *Quality Assurance Program Manual*.

Daniel W. Blocher, P.E.
Executive Director
Capital Projects Division

6.27.11

Date

Introduction

The Federal Transit Administration (FTA) requires grantees undertaking capital programs to prepare a *Project Management Plan* (*PMP*) that includes a quality program comprised of a written quality policy, written procedures, management that supports and takes responsibility for quality, and personnel who undertake quality assurance and quality control activities. The overall management policies of the quality assurance program are outlined in Section L of the *PMP*. This Capital Projects Division *Quality Assurance Program Manual* (*QAPM*) provides further requirements for implementation of the division's quality effort.

The *QAPM* provides for the implementation of administrative and control measures during engineering, design, procurement, construction, installation, testing start-up and closeout. The controls will facilitate early identification of conditions that might adversely affect satisfactory completion of the project. The administrative and control measures will be prepared and implemented in such a manner as to contribute to and document the attainment of a safe, reliable, economical and convenient public transit system.

Each project bid/proposal document and contract for engineering, design, construction or other service will be reviewed by TriMet's QA Manager (QAM) to determine the specific portions of the quality assurance program or quality control effort that are to be implemented. The program for each contract is to be based on its size, complexity, uniqueness, and impact on the safe and efficient operation of the transit system.

The controls necessary for preserving the integrity of quality-related activities and the required documentation of the results are categorized into three general areas as follows:

1. Documentation to include a review of design, contract and procurement documents, as well as testing, inspection and start-up procedures, to verify that quality aspects have been included
2. Product quality evaluated during surveillances and monitoring of manufacturing, construction, installation, inspection, testing and start-up activities to verify adherence to design, contract, and procurement requirements
3. Process quality evaluated during surveillances and audits of quality assurance and quality control program activities, to ensure compliance with procedures and documentation of the activities

Purpose/Objective

It is the intent of this QAPM to ensure that the Division has an effective quality assurance program. The purpose of the *QAPM* is to provide the processes for implementation of the TriMet quality assurance program through written procedures and plans, surveillance and audits and documentation of such activities by utilizing guidelines provided herein or from other referenced division manuals/programs. The objective is to attain the required level of quality during all engineering phases, design, procurement, construction, installation, testing, start-up and closeout of a project.

Scope
This *QAPM* encompasses all activities, TriMet or otherwise, related to the preliminary engineering, design, construction, testing and start-up of a project. Guidelines for managing the preliminary engineering and final design efforts are described in Section 3 of this document. Consultants (including sub-consultants), designers, suppliers, contractors and subcontractors will conform to the applicable quality program requirements as stipulated in their unique contract documents.

Each directly contracted (i.e. prime) consultant, designer, manufacturer, contractor and supplier will be required to submit a QA/QC or QC Program that is adequate for their applicable contractual scope of work and as stipulated in their unique contract documents. Sub-consultants, sub-contractors and suppliers to a contractor may provide stand alone QA/QC or QC programs for review or are subject to the quality program established by the prime. Appropriate submittals will be reviewed by TriMet's QA Manager, and other TriMet representatives, for comment and disposition prior to implementation. The basis for the review may include this document, FTA Quality Guidelines or the quality related specification sections in the contract documents.

Responsibility
The TriMet Quality Assurance Manager (QAM) is responsible for the administration of the *QAPM*. The QAM has been delegated the authority and organizational freedom to:

- identify and evaluate any and all quality problems and
- initiate, recommend, or provide solutions and to control further processing, delivery, or installation of non-conforming or deficient items or services until proper disposition is obtained

The QAM will ensure that schedule and cost considerations do not compromise quality and will report directly to the executive director of the Capital Projects Division. Responsibilities and duties of the TriMet RE and inspectors, while discussed in this document, are described in detail in the Capital Projects Division *Resident Engineers Manual* and *Inspectors Manual.*

Implementation
The QAPM will be implemented in accordance with the project's needs and the procedures contained in this document. The QAM will review project bid and proposal documents to ensure that this *Quality Assurance Program Manual* is applicable for the scope of work or if quality related Special Provision sections are sufficient. The need for developing a consultant/designer/contractor/supplier Quality Assurance/Quality Control Program will be included in all requests for bids or proposals as required.

Revisions
Revision and maintenance of the *QAPM* is the responsibility of the TriMet QAM. Revisions will be made at any time necessary. An overall review of the program and personnel will be made annually to determine if any revisions are warranted. Changes to the QAPM will be performed by the TriMet QAM and submitted for review and approval by the executive director of the Capital Projects Division. Notification will be made regarding revisions to the program. Draft versions and revisions of this document in a draft format shall be clearly marked as "Draft", "Sample" or as "Uncontrolled" and distributed on an as-needed basis only. This document shall not be distributed as an official document unless it has been reviewed and approved by the executive director of TriMet Capital Projects (see Page 4, Management Commitment Statement).

Precedence
In the event that there is a discrepancy between Section L of the *PMP* and this manual, the more stringent requirements shall take precedence, and both documents will be subsequently revised to return the two documents to alignment.

Quality Assurance Program Implementation

Section 1 - Management Responsibility

1.1 Purpose
This section describes the management responsibility, organizational structure, and chain of command for quality assurance (QA) and quality control (QC) activities on a project.

1.2 Scope
These requirements apply to TriMet and its consultants and contractors who will perform activities that affect the overall quality of the project.

1.3 Policy
Authority, accountability, and responsibility of QA/QC staff must be identified for each organization. The management structure, function and chain of command of each organization should be clearly established.

1.4 Procedures
1.4.1 Organization: The structure for any organization assigned to perform work affecting quality will be that organization's responsibility, subject to approval by TriMet or those delegated by TriMet. Each QA/QC staff organization will be structured in such a manner that:

1. Quality is achieved and maintained by those who have been assigned responsibility for performing the work. (i.e. the consultant/engineer/designer, contractor, supplier, manufacturer)
2. The organization responsible for assuring quality will have sufficient authority, access to work areas, and organizational independence to identify quality problems; verify implementation of solutions; and assure that further processing, delivery, or installation is controlled until proper disposition of a deficiency, nonconformance or unsatisfactory condition has occurred.
3. Quality achievement is verified by persons or organizations not directly responsible for performing the work. (i.e. the Owner, QA or QC Managers, Inspectors, Independent Material Test Labs, etc.)
4. Quality verification functions will report to a level of management that provides sufficient authority and organizational freedom to assure that appropriate action is taken to resolve conditions adverse to quality.

1.4.2 Assessment: The adequacy and effectiveness of project quality program will be regularly and formally assessed by the management of organizations implementing the programs and by the TriMet QA manager.

1.5 Responsibility

The executive director of Capital Projects has assigned the responsibility of assuring the development, establishment, implementation and evaluation of the *Quality Assurance Program Manual* (*QAPM*) to the TriMet QA manager (QAM).

The QAM is responsible for:

- Assuring that the Division's quality assurance program is established and maintained
- Review and disposition (approval) of the contractor's or consultant's quality program for compliance
- Providing consultation and direction regarding quality issues to design, construction, and supply contractor organizations
- Monitoring program implementation, through continuous observation, surveillance and audits and evaluating adequacy and effectiveness
- Coordination of the Division's quality assurance program with contractors' quality control plans to ensure that TriMet quality policies are not compromised.
- Resolving conflicts regarding the intent of the QAPM

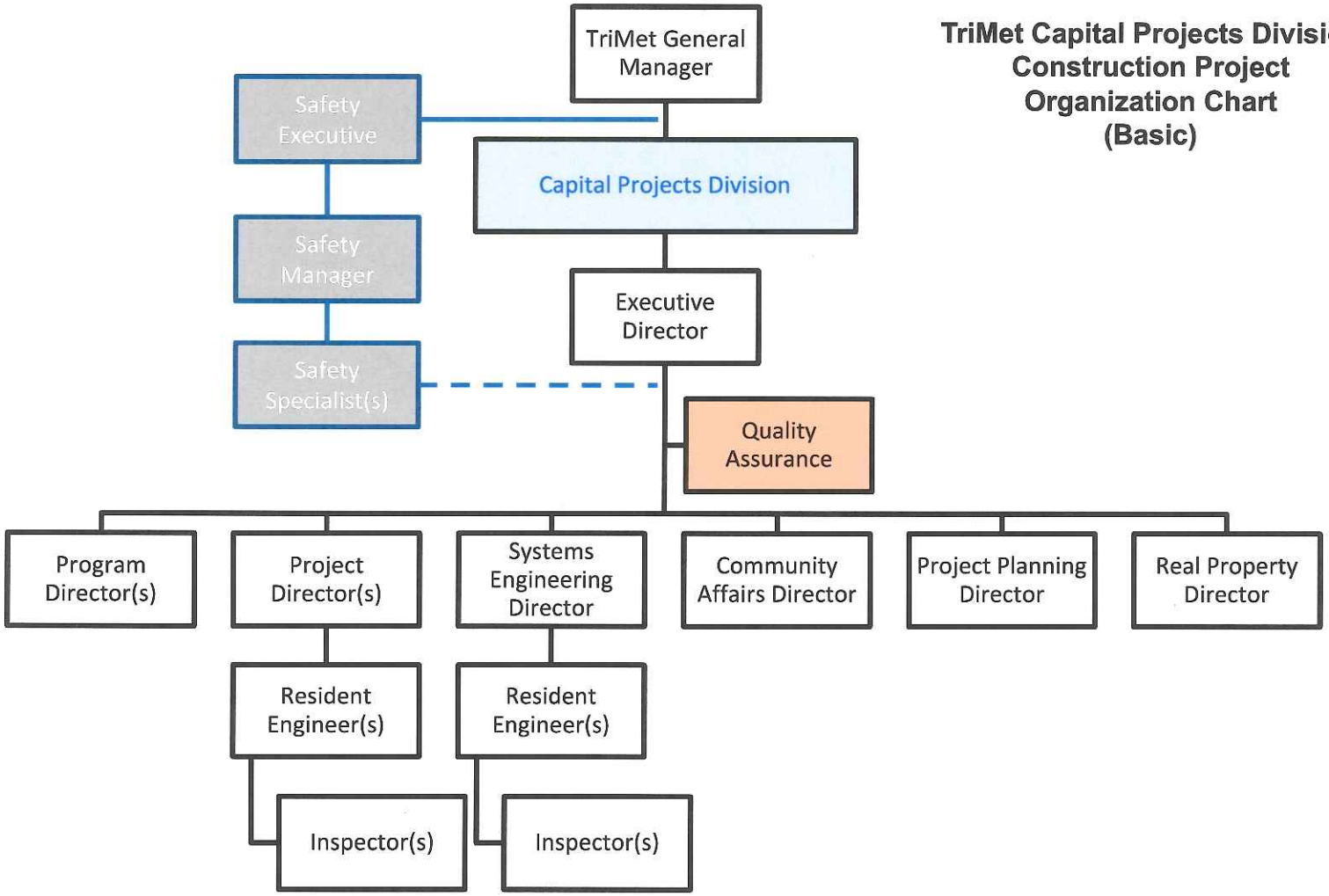
The QAM is provided with the complete organizational freedom to investigate quality related activities in all areas of the project and to identify any quality problems. The position retains authority to control further processing, delivery, or installation of a nonconforming or deficient item or service until proper disposition has been obtained; to initiate, recommend or provide solutions, and to verify implementation of solutions. In matters of quality the TriMet QA manager shall have complete and ready access to the executive director of Capital Projects.

Any decision made by the TriMet QA manager regarding the applicability or interpretation of the QAPM to TriMet staff, consultants, designers, contractors, sub-contractors or others who may work on the project is subject to review only by the executive director of TriMet Capital Projects or the TriMet general manager.

1.6 Attachments

1-1 Capital Projects Division Construction Project Organization Chart

TriMet Capital Projects Division Construction Project Organization Chart (Basic)



Section 2 - Quality Assurance Program and Documentation

2.1 Purpose
This section describes the TriMet QAPM and assigns responsibility for developing, approving, and implementing quality procedures.

2.2 Scope
The QAPM described here applies to all TriMet Capital Projects.

2.3 Policy
The Quality Policy Statement requires a quality assurance program to ensure that the expected level of quality is achieved. Implementation of the TriMet QAPM is described throughout this Manual.

2.4 Procedures
The quality assurance program consists of three elements, as follows:

1. The governing policies and general requirements specified in the *PMP*'s Quality Policy Statements and this QAPM.
2. A quality plan prepared specifically by each prime consultant, contractor or supplier contract as required per the scope of work.
3. Subcontractors or suppliers to a prime consultant, contractor or supplier may either submit a quality program/procedure for review and comment that applies specifically to their scope of work or they will be required to comply with the program developed by the prime, as it relates to their scope of work.

The requirement for implementing an effective quality program will be included in all Requests for Bid/Proposal (RFB, RFP). The quality program requirements will be outlined at pre-bid conferences, post-bid negotiations and project "pre-construction" meetings and the guidelines for developing a contractors program may come from this manual, the FTA Quality Guidelines or from the quality assurance/quality control specification sections contained in the contract documents.

Consultants/contractors/suppliers will be required to adhere to the requirements and standards set forth in their own quality program, which has been reviewed and approved by TriMet.

All contract-specific quality plans will be properly documented and must be submitted to the TriMet QA manager for review and comment. The QAM will confer with the TriMet Design Manager or TriMet Resident Engineer prior to the issuance of a final decision on acceptance or rejection of the proposed plan. The TriMet QAM will provide a disposition status for the document.

This *Quality Assurance Program Manual* and the contract-specific Contractor quality plans will be subject to an annual review.

- The TriMet QAPM will be evaluated by TriMet upper management to ensure adequacy and effectiveness of policies and personnel.

- Contractor quality plans will be reviewed by the TriMet QAM to assess the adequacy and effectiveness of policies and personnel.

2.5 Responsibility

Consultants and contractors/suppliers are responsible for developing, implementing, and maintaining a quality plan that satisfies the requirements of their contract documents. In the event a contractor subcontracts a portion of the work, the accountability for the quality plan remains with the primary contractor. The primary contractor may, however, delegate responsibility for portions of the plan to the performing subcontractor, subject to TriMet's approval.

TriMet personnel performing quality functions will be qualified by training and experience according to Section 15 of this manual. The acceptability of quality oriented training and personnel will be subject to evaluation and approval by the QAM and the project manager/design manager/RE/project director.

The TriMet design manager and RE are responsible for the day-to-day management of the requirements of this QAPM and oversight of their designers/contractors quality program.

The TriMet QAM is responsible for administration and implementation of the TriMet *QAPM*. The QAM shall review all applicable quality contract documents prior to solicitation of the contractor. The QAM will also review the contractor's proposed quality plan(s).

The QAM is responsible for verifying the effectiveness of the division's quality effort through observation, surveillance, inspection, review of documentation and audits, or by other means as required.

2.6 Attachments

Not applicable

Section 3 - Design Control

3.1 Purpose
This section describes the requirements for the quality of preliminary engineering and final design activities associated with a project.

3.2 Scope
These requirements apply to all design activities, both on and off-site, including but not limited to the design of the trackway, structures, systems and equipment. The guidelines of this section are most closely associated with the TriMet Design Criteria, Appendix A and the following sections in this document: Management Responsibility, Document Control, Quality Records, Quality Audits and Training.

3.3 Policy
All design consultants are required to develop and maintain a design quality plan (DQP), acceptable to TriMet, to govern the consultant's work in accordance with this *QAPM*, and the contract documents. The proposed DQP may differ from the recommended procedures described in the attachment at the end of this section, which are utilized by TriMet. A designer/consultant may elect to utilize the procedures provided within this section. The intention to utilize the TriMet *QAPM* document shall be delineated in writing to TriMet.

3.4 Procedures
3.4.1 Consultant Design Quality Plan: A CDQP will be submitted to TriMet for review and disposition by the QA manager and project manager/design manager, prior to the start of work on the project. The plan will include as a minimum:

- Design basis, including scope of work, technical requirements, applicable codes and standards, design criteria, performance characteristics, conceptual design, and other design parameters delineated in such a way as to facilitate the design process and as required by contract documents.
- Design interfaces between different design groups and disciplines and the quality responsibilities of each.
- Management of electronic design documents shall be performed in accordance with the TriMet *Design Criteria*, Appendix A, Drafting Procedures and the TriMet electronic document management system.
- As-built document guidelines (Attachment O of Appendix A in the *Design Criteria*) must also be addressed.
- Design review procedures, conforming to the requirements stated below.

    1. Design document control, using a numbering system prepared in accordance with TriMet requirements.
    2. Drawings and specifications will be tracked in TriMet's computerized drawing management system. Other documents will be tracked in separate logs maintained by the design consultant.
    3. Design calculations and verifications will also be maintained by the consultant.
    4. Design documents will be subject to a review/check process, and coordinated with interfacing design disciplines or groups.

5. Design documents must be controlled to assure the use of approved documents, maintained in physical files recording document evolution, and distributed in accordance with a master distribution list prepared for the project and/or per TriMet instructions.
6. Design documents will provide for identification of items important to quality and safety by providing traceability of the item through part numbers, heat/log numbers, serial numbers, or other means.
7. Internal quality assurance audits of the DQP activities by the consultant.
8. Documentation procedures to maintain records of quality control and quality assurance activities performed by the consultant(s).

Design activity will be governed by applicable regulatory requirements and TriMet's *Design Criteria*, and these requirements shall be incorporated into the specifications and drawings. Appropriate quality standards and criteria for the completed project will be specified by the designers in the design documents. These quality levels will be established by considering the criticality of the system or subsystem element being designed with regard to safety, reliability, maintainability and performance.

3.4.2 QC Design Reviews: QC design reviews will be performed by the designers throughout the design process to determine that the design aspects have been accurately expressed and to verify the constructability of the design. Design reviews will include:

1. Independent check of drawings and calculations
2. Consideration of constructability/cost benefits
3. Verification that appropriate quality levels and standards have been specified for the intended use, and that parts, materials, equipment, and processes specified are appropriate to the application
4. Review of appropriateness of design methodologies, such as modeling, analysis, evaluation of historical data and simulation

QC design reviews, checking, alternate calculations, and other means used to verify the design will be performed by personnel other than those who originated the design but with qualifications at least equal to those of the originators. Review personnel may be supervisors if they were not involved in the actual design effort.

All checkprints and checked copies will be considered part of the design quality records. As such, they will be retained in the project files as evidence of compliance with the project or contract quality requirements.

Design changes (revisions) will be subject to checking, coordination, and design review to the same level as the original design. Superseded design documents will be marked and retained for information purposes.

3.4.3 Stakeholder Design Reviews: TriMet staff, along with appropriate jurisdictional representatives, will also perform design reviews. These reviews will be focused on construction, operational, safety and code compliance suitability of the proposed design. Although these reviews may uncover errors or inconsistencies, they are not intended to be a duplication of, or substitute for, the designers QC design reviews. Stakeholder

design review comments will be tabulated on a "Document Review Comment Form," an example of which is included as an attachment at the end of this section. The TriMet design manager will oversee this effort and ensure that all concerns are adequately dispositioned and documented.

3.4.4 TriMet Quality Assurance: TriMet QAM will perform audits and surveillances of the design quality process to verify that the approved quality plan has been implemented. QA activities will include sampling design documents. QA staff will also examine the consultants' quality documentation to verify that the quality record is complete.

3.5 Responsibility

The following information provides the basic management responsibilities of the individual staff on the design team and the quality management responsibilities for each individual. A Project Organization Chart shall be developed for each design group.

The design manager/project manager is responsible for overall coordination of the design effort. This includes completeness of design packages and ensuring that schedule milestones are achieved. This person will also have the responsibility of oversight quality control duties for all of the design efforts of their staff to include:

> The CAD lead is responsible for the drawing management system and for updating electronic drawings based upon comments provided and evaluated by the design lead.
>
> The functional design leads are responsible for coordination of all items related to their assigned specialty for the project. Areas that may require functional design leads include architectural, art, civil, electrical, landscaping, mechanical, structural, systems (OCS, signals, communication), track, traffic and utilities. Additional functional design lead personnel may be assigned as the project evolves. Changes will require that the organization chart be updated. Each functional design lead person is responsible for primary quality control activities within their specialty.
>
> The Design Team Support Personnel may be called upon by a functional design lead to provide technical insight to a specific area under the design effort. For the purposes of the organization chart names may not be specifically defined for these positions since each person may support multiple design efforts.

TriMet's design discipline and section engineers are responsible for TriMet's design reviews according to the requirements of the PMP and this document.

The project director is ultimately responsible for the completeness and accuracy of TriMet's design reviews.

The person performing configuration management activities will provide oversight of the design effort as it relates to cost and schedule impacts and will work closely with the project director.

The TriMet QAM is responsible for QA audit activities and quality issue disposition for design activities.

3.6 Attachments

3-1 Design Document Management Procedures and Flowchart
3-2 Document Review Comment Form
3-3 Design Document Review Stamp

Design Document Management Procedure

The following are design document management procedures utilized by TriMet when undertaking the development and advancement of design documents. Based upon contract requirements a consultant may be required to submit similar procedures for review and approval prior to initiating a design effort. These TriMet guidelines may be adopted in their entirety by consultants, which shall be acknowledged in advance in writing by the consultant.

3-1.1 Lifecycle of Documents: The following are the various typical stages of documents as they pertain to a Project. (Note: This document does not provide a guideline for when a document may obtain a quantifiable percentage complete stage, such as 50% Preliminary Engineering (PE), 100% PE, 60% Final Design (FD), 95% FD or Issued for Construction (IFC). Milestones will be predetermined by the Project Director and included in the contract. Quality Control oversight of milestone documents will be performed by the Functional Design Lead and the Design Manager. Quality Assurance activities will be performed by the QAM.)

3-1.1.1 Preliminary Engineering: The intent of the PE phase is to establish the scope of the project based upon the budget and to ensure that the 100% PE documents meet the standards established in the TriMet Design Criteria and applicable codes.

NOTE: Document Checking for PE Design Activities - QC checks of the PE documents shall be performed as determined by the Project Director/Design Manager. A final review will be made of the 100% PE documents for compliance with scope, budget, criteria and codes.

3-1.1.2 Final Design (FD)/Issued For Construction (IFC): The documents turned-over at the completion of PE will become the baseline documents for the FD/IFC phase of work. As documents are revised they will undergo a Designer (In-Progress) and QC Technical Check Document effort.

- Designer (In-Progress) Document – Functional Design Leads will expand upon their assigned documents by following the guidelines noted below for the marking of documents.
- QC Technical Check Document – This document is utilized for the formal technical check of the design effort.

When the design activity is complete, multiple Designer (In-Progress) and QC Technical (Check) document updates may exist for a particular document depending upon how frequently it is revised throughout the Final Design phase.

A Professional Engineer or Architect, registered in the State of Oregon, of the appropriate background shall stamp/sign all Issued For Construction Drawings.

3-1.1.2.1 Document Marking and Checking for Final Design/Issued For Construction Design Activities: Due to the highly technical nature of the FD/IFC phase, an audit trail will be maintained to record the design progress and changes in direction. The document audit trail shall take the form of a series of documents such as Design (In-Progress) documents, QC Technical Check documents, Document Review Comment Forms and meeting minutes filed in reverse chronological order. The prints shall be used to direct the modification of the documents by the CAD Department and to document the confirmation of changes.

3-1.1.3 Additional Guidelines for the Final Design / IFC Stages of the Design Effort

3-1.1.3.1 Use of the Document Review Comment Form (Attachment 3-2 in the QAPM)
(Reviewers who select not to make review comments directly on the document may utilize the Document Review Comment Form, Attachment 3-2, included in the TriMet QAPM.)

The document that is the source of the review shall be noted on the form. After comments have been entered on the form it shall be returned to the entity that issued the document for review. Each review comment will be reviewed, evaluated and statused per the codes indicated at the bottom of the form. Deficiencies and discrepancies that exist on the document shall also be noted on this form for review and comment. One copy of the completed form shall be returned to the originator. One copy of the form will be included in the document file. Acceptable changes provided through Document Review Comment Forms will be annotated on the document by the Functional Design Lead per the Document Mark-Up guidelines and become part of the Document Review Stamp process.

The CAD department will only make their document revisions from the document itself and not from Document Review Comment Forms.

3-1.1.3.2 Use of the Document Review Stamp (Attachment 3-3 in the QAPM)
The design participants who perform revisions, reviews and QC checks of the Project documents shall adhere to the following procedures.

3-1.1.3.2.1 Design (In-Progress) Document: After a Design (In-Progress) document has been marked-up for revision, the person performing this function will sign and date the stamp and forward the document to the person responsible for drafting the changes on the document (i.e. the CAD department). After the document is redrafted the CAD department prints a clean copy. This copy will also include a Document Review Stamp. The CAD department will then sign and date each document stamp and return both documents back to the person who supplied the revisions. This design person will then perform a Designer check of the document to ensure that additions, deletions and changes to the documents were accurately performed.

If changes made by the Drafter are incomplete, inaccurate or unacceptable for any reason the Designer will make changes per the mark-up guidelines below, sign and date again in the Designer blocks of the stamp on the latest CAD document and then return it to the CAD department. This process shall be repeated until the updates accurately reflect Designer mark-ups.

If updates are acceptable, the Designer will then sign and date the 'Designer Check' blocks of the new document stamp and return it to the CAD department. Both Design (In-Progress) documents will be filed in the document folder.

3-1.1.3.2.2 QC Technical Check Document: When a technical review of the design document is required the Technical Reviewer will review the above clean print, with the drafters and designers signatures in the review stamp.

If revisions are needed to the document the Technical Checker will perform mark-ups as described below, sign/date the appropriate blocks and return the document to the Functional Design Lead to allow a review/discussion, or concurrence, regarding the mark-ups. The Functional Design Lead will then complete the 'Designer' name and date blocks and forward the document back to CAD for drafting updates. After the document completes the CAD/Designer

process described above it shall be clean printed and returned to the QC Technical Checker for a follow-up review.

If no changes are required to the document, the appropriate name and date blocks shall be completed. The document shall be returned to the CAD department for printing of a clean document, with a blank stamp. This document will be filed in the folder and held until such time as the next review or design stage is necessary.

3-1.1.4 Document Mark-Up Guidelines for In-Progress, Drafting, Design Check and QC Technical Check Activities: The following procedure shall govern the marking of documents during Final Design/Engineering:

Marking-up for Designer (In-Progress) Revisions:

Marking of documents by the Functional Design Lead, Reviewer, CAD department and QC Technician shall be in accordance with the following legend:

- Red Ink – additions to linework and/or text;
- Green Ink – deletions to linework and/or text;
- Blue Ink – instructions for the CAD technician; calculations or notations for reference/explanation, but not to be added to the document;
- Yellow Highlighter - the CAD department shall use yellow highlighter to check, or otherwise delineate revisions incorporated into the updated document;
- Blue Pencil (Design Check) – utilized by the Designer to verify that CAD changes on the revised clean document are correct.

Marking-up for QC Technical Check activities

- Orange Highlighter (QC Technical Check) – utilized by the QC Technician to verify that critical elements, that are germane to the individual document and not necessarily every line work and design annotation, are acceptable on the document.

3-1.1.5 Technical Specifications: Specifications shall be governed as follows:
The Functional Design Lead, or their designated representative, will be responsible for the preparation of the specifications covering their respective disciplines, starting from the TriMet baseline specifications. Specifications for the project shall be examined for consistency and clarity and review comments shall be entered on a Document Review Comment Form and returned to the author of the specification for review and disposition. The author will change the document utilizing a redline strikeout process. Documents displaying proposed changes shall be maintained as quality records, along with a clean revised version of the document.

A Professional Engineer or Architect, registered in the state of Oregon, shall stamp and sign all final specifications.

The final version of the specifications will be maintained in TriMet's electronic document management system.

3-1.1.6 Design Calculations and Check(s): Primary calculations supporting the design of the project will be placed into the archives. An orderly and concise calculation process shall be utilized. Calculations shall be made on calculation sheets and shall include the following information:

> Project Title, Design Element, Name of Designer, Date of Calculation, Name of Checker, Date of Check, Sheet Number

Design Elements that are not calculated, but are derived from standard details or other resources from the designer's experience, shall be noted with a reference to the source and filed with the calculations.

Printouts from computer analysis and/or design programs, which are to be a permanent part of the design files, shall include sequential page numbers, whether stand-alone or part of manual design calculations. As a minimum computer printouts are to be checked by verifying the input data. It is acceptable to list the Project Title, Design Element, Designer (and date), Checker (and date) on the first sheet of the computer printout only, although Sheet Number (x of xx) is required on every page.

Sketches, which illustrate or clarify design assumptions and the final configuration of designed elements, shall accompany the pertinent design calculations. The sketches shall contain sufficient detail such that the plan checker can use them in confirming that the information on the plans represents the actual design.

At the discretion of the QC Technical Checker, the design checking procedure will consist of either: a) a detailed check of the original calculations or b) independent calculations of the various elements, or both. The QC Technical Checker will note which procedure was used and why as part of his/her checked calculation sheets. The checker's initials and the date of check shall be included on checked calculation sheets.

These documents shall be logged into the Document Control system and a copy shall be maintained in a central, accessible location for review purposes.

3-1.1.7 Design Review/Coordination Meetings

3-1.1.7.1 QC Design Reviews: QC design reviews will be performed throughout the design process to ensure that the design aspects have been accurately expressed, coordinated with other disciplines and to verify the constructability of the design. Design reviews will include:

- Independent check of drawings and calculations
- Consideration of constructability/cost benefits
- Verification that appropriate quality levels and standards have been specified for the intended use, and that parts, materials, equipment, and processes specified are appropriate to the application
- Review of appropriateness of design methodologies, such as modeling, analysis, evaluation of historical data and simulation

QC design reviews, checking, alternate calculations, and other means used to verify the design will be performed by personnel other than those who originated the design, but with appropriate technical qualifications. Review personnel may be supervisors if they were not actually involved in the design effort. The clean file folder document described above will be utilized for this purpose.

All Designer (In-Progress) and QC Technical Check documents will be considered part of the design quality records. As such, they will be retained in the project files as evidence of compliance with the Project quality requirements.

Design changes (revisions) will be subject to checking, coordination, and design review to the same level as the original design. Superseded design documents will be marked and retained for information only.

3-1.1.7.2 Stakeholder / Project Team Design Reviews: TriMet staff, consultants, contractors, along with appropriate jurisdictional and partner agency representatives, will also perform design reviews. These reviews will be focused on construction, operational, safety and code compliance and the suitability of the proposed design. Although these reviews may uncover errors or inconsistencies, they are not intended to be a duplication of, or substitute for, the QC design reviews. Design review comments will be tabulated on the "Document Review Comment Form," an example of which is included as an attachment at the end of this section.

3-1.1.7.3 Quality Assurance Reviews: Quality Assurance representatives will review/audit the design process to verify that the approved quality plan has been implemented. QA activities will include sampling design documents for adequacy and completeness. QA staff will also examine the QC documentation to verify that the records are complete.

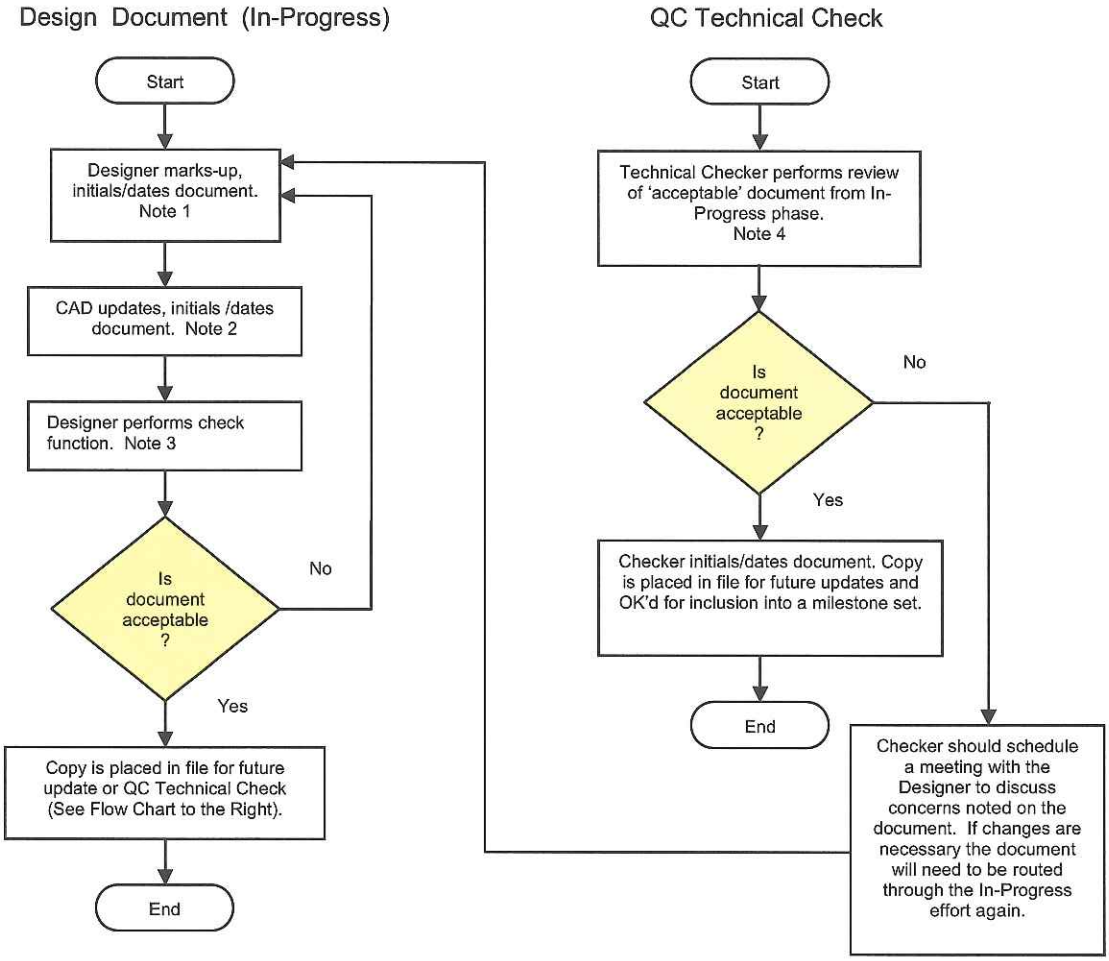
3-1.1.8 Document Organization:

- Option 1: Documents are to be retained in individual file folders (1 folder per drawing sheet), clearly labeled, for ease in identification and retrieval. As revisions are performed the most current document shall be placed in the front of the folder (i.e. reverse chronological order).
- Option 2: Document 'Sets' may be assembled based upon the discipline in question (Architectural, Mechanical, Structural, etc.) and filed accordingly with the most current document set in front.

Files are to be maintained and controlled in a central location. Designers shall copy the latest page from the file to perform updates, while the file remains in the centralized location.

Design Document Management Procedure Flowchart

Entities advancing documents for design purposes must have authorization to access the TriMet electronic document management system and follow the parameters established by the TriMet CAD Manager and contract documents. The following process shall be followed for routine/ongoing document updates (in-progress) and established milestone check activities for the Preliminary Engineering and Final Design phases.



NOTES:

1. Color codes for marking and advancing design documents: Red = Additions; Green = Deletions; Blue Pen = Instruction to CAD technician, including calculations/notes, for explanation but not for inclusion.
2. CAD steps include: Highlighting (in Yellow) proposed changes on Designers marked-up drawing after making appropriate updates to the electronic file, updating signature block to include CAD initials/date and printing and returning a clean copy and the original marked-up copy for the Designer's Check activity.
3. Designer's Check activity includes: On clean copy provided by CAD, verifying that updates and changes are accurate and acceptable. Lightly checkmark new documents where acceptable with a blue pencil. If all items are acceptable initial and date the stamp or signature block. If items are unacceptable utilize color-coding scheme described in Note 1 to provide further clarification to CAD.
4. Technical QC Check activity includes: On the acceptable copy created in the Design Document (In-Progress) Phase which is initialed by the Designer and CAD, the Checker reviews for acceptability, highlighting (in Orange) checked items. If necessary, mark-ups shall be performed in accordance with the colors delineated in Note 1 or a meeting should be scheduled to discuss items with the Designer. If the document is acceptable the Checker shall initial/date the stamp or signature block and place the document back in the file.
5. It may be necessary at some point for CAD to print a clean unmarked copy of the acceptable document and place it in the file for future reference and use.

TRIMET

EXAMPLE

Document Review Comment Form

Reviewer's Name (Print):_____

Review Organization:_____ Date:_____

Document Reviewed:_____

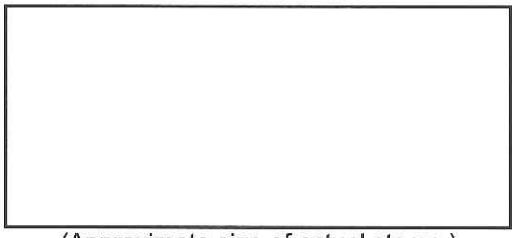
TriMet MASTER COMMENT NO.	Reviewer's Comment No.	Drawing/Page/ Item Number	REVIEWER'S COMMENT	DESIGNER'S or CONTRACTOR'S RESPONSE	ACTION CODE

Action Codes:
1. No exception taken
2. Exceptions noted, resubmittal not required
3. Exceptions noted, resubmittal required
4. Rejected
5. Review Not Required

TRIMET

EXAMPLE

Design Document Review Stamp



(Approximate size of actual stamp.)

Typical items to be contained on the Document Review Stamp (Layout Example)

Original Print Date _____

Document Activity	Name	Date Completed
Designer		
Drafter		
Designer Check		
QC Check		

Section 4 - Document Control

4.1 Purpose
This section describes the processes utilized for the systematic control of documents developed during design and construction.

4.2 Scope
These requirements apply to agency staff or consultant/contractor prepared design and construction documents that are issued as TriMet project documents and all documents received by the project. These requirements do not apply to documents such as the *Resident Engineers Manual, Inspectors Manual,* the *Project Management Plan* (*PMP*) or the *QAPM*, which are addressed in the division *Business Procedures Manual (BPM).*

4.3 Policy
Project documents will be controlled in accordance with established document control procedures. Quality measures will be used to verify conformance.

4.4 Procedures
4.4.1 Document Control: The *PMP* includes requirements for control of documents. An electronic database will be used for cataloging both incoming and outgoing documents. Documents will be assigned a control number for identification and filing. Document control files will be centralized.

Field offices will also use the document control system. At the completion of the field activity, the field files will be merged with the central files. All project files will be archived at the completion of the project in conformance with statutory requirements according to TriMet's Capital Projects Division *BPM.*

Consultants and Contractors for the project will be required to develop a filing system for their documents. All project documents sent to TriMet, or developed for TriMet's issuance, will be incorporated into TriMet's document control system and central files. Contract drawings and specifications will be handled separately and are discussed below.

4.4.2 Drawing and Specification Control: TriMet has established a computerized, internet-based database system for storage, distribution and management of all project engineering drawings and specifications. Consultants are provided access rights to read and/or write to the files depending on assigned "ownership" of the individual drawing. Documents are checked out during design activity and are checked back in by the end of the current week, to expedite the design effort. Final document production and distribution is the responsibility of TriMet. Exceptions shall be documented and submitted to TriMet for review and comment.

Documents checked back into the database will be checked by TriMet for adherence to required standards as follows:
- Reference files will be reviewed on the system before being returned to the database.
- Sheet files will be plotted and reviewed to confirm acceptability.
- Random checkplot reviews will be conducted on an ongoing basis.

4.4.3 Quality Assurance: The project document control system and the contractor's document and drawing control systems will be subject to surveillance or audit by the TriMet QA manager at any time.

4.5 Responsibility

Consultant and contractor project managers are responsible for organization and control of their internal files and for providing required project documents to TriMet for inclusion in the document control system.

The TriMet CAD manager is responsible for the electronic document management system.

The TriMet program directors are responsible for development and implementation of the document control system.

The TriMet QAM is responsible for QA audits/surveillances of the document control systems.

4.6 Attachments

Not applicable

Section 5 - Purchasing, Equipment Procurement and Construction

5.1 Purpose
This section describes the required quality control measures for critical material or equipment procurements and construction and installation contracts to assure that contractual and design requirements have been achieved.

5.2 Scope
The requirements of this section apply to critical procurement (e.g. track materials) and construction/installation contracts (e.g. civil and systems) for the project.

5.3 Policy
TriMet policy requires adequate control of the quality of procured materials, equipment and construction services, with sufficient procurement documentation to confirm compliance with design and contract requirements.

5.4 Procedures
5.4.1 Procurement Control: Project procurement procedures will include requirements for control of procurement activities such as, but not limited to development of contracts and purchase orders, compilation of bid and vendor lists, pre-award audits, etc. The procedures shall identify how and by whom purchasing documents are reviewed, revised and approved.

The procurement document will include contractor/supplier requirements for quality of the provided materials, equipment and construction. These requirements will be determined by TriMet staff and the design consultants on a contract-specific basis. The TriMet QA manager will review the bid packages to verify that the appropriate quality specifications are included.

Contractor, subcontractor, to include vendor and supplier, evaluation and selection may be based upon:
- Review of quality program
- Review of records of past performance
- Facility survey and reference checks
- ISO 9000 registration

Contractors shall describe the evaluation and selection process for subcontractors at all tiers, including the priority of quality in the selection process. This item shall be addressed in their quality plan.

Procurement documents will include the TriMet's right of access to contractor and subcontractor/vendor facilities to inspect, audit, or otherwise verify that the purchasing requirements are being satisfied.

5.4.2 Quality Control Plans: The contract documents will also contain the requirement for the supplier or contractor to develop and submit a quality plan covering the activities to be performed under the contract.

In cases where procurement contracts include requirements for design (e.g. systems component design, temporary works design), the contractor's quality plan shall include design activities. Design and preliminary engineering activities shall be conducted in conformance with Section 3 – Design Control, of this manual.

Prior to the start of work covered by the quality program, suppliers and contractors will develop and submit their quality plan to TriMet for review and approval. The plan will describe the means by which the organization will assure that contract quality requirements are satisfied. The type of quality program and its complexity will be specific to the needs of the contract. Overly complex and costly programs will be discouraged.

The requirements of the quality plan will also be applicable to all lower-tier subcontractors or suppliers.

The quality plan will include at a minimum the following components:

- A description of the supplier/contractor's quality organization and their quality staff's experience and authority.
- A detailed description of the quality control procedures covering the manufacturing, fabrication, construction and installation activities required under the contract.
- A detailed description of the procedures for control of materials and special processes conforming to the requirements of Sections 6 and 7 of this manual.
- Inspection and test plans, including procedures and checklists conforming to the requirements of Sections 8 through 10 of this manual.
- A description of procedures for managing nonconforming work or program shortcomings (corrective actions) conforming to the requirements of Sections 11 and 12 of this manual.
- Audit and surveillance guidelines applicable to subcontractors and suppliers.
- A description of documentation of QC activities.

The TriMet QAM may review prime contractors and suppliers during the bid process prior to the contract award, or subsequent to contract award, to evaluate the bidder's or prime contractor's qualifications with regard to the quality program. Quality program review forms are included as attachments to this section.

5.4.3 TriMet Resident Engineer (RE) & Inspectors: A TriMet RE and inspection staff will be assigned to each contract to provide on-site quality inspection and oversight of the contractor's quality activities. Responsibilities of the RE and inspection staff as related to quality are described in Sections L.8 and L.9 of the *PMP*, other sections of this *QAPM* and the TriMet *RE Manual* and *Inspectors Manual.*

5.4.4 TriMet Quality Assurance: TriMet's QA manager will perform quality assurance activities to verify the contractor/supplier's adherence to its approved quality plan. Primary QA activities will be the performance of quality audits and surveillances, in conformance with Section L.5 of the *PMP* and Section 14 of this manual, and site visits.

5.5 Responsibility

TriMet's design team (staff and consultants) is responsible for determination of the required quality requirements and standards for the work included in the material, equipment or construction contract.

The supplier or contractor is responsible for development, implementation, and documentation of a quality plan for its contract work.

The TriMet RE and inspection staff are responsible for day-to-day verification and oversight of the contractor's quality activities.

The TriMet QAM is responsible for:

- Verification of suitability and sufficiency of the quality requirements included in the bid package
- Evaluation of the quality control capabilities of the contractor proposed for award
- Review and approval of the contractor's proposed quality plan
- Quality assurance audits and surveillances during the term of the contract and evaluation of the effectiveness of the contractor's quality program

5.6 Attachments

5-1 Quality Assurance System Evaluation
5-2 Essential Elements of a Quality Program – Evaluation Summary

TRIMET

EXAMPLE

Quality Assurance System Evaluation

Evaluation Report No.: _____ Page ____ of ____

Organization: _____ Contract Number: _____

ISO 9000 Registration: _____

Project Description: _____

_____

Personnel Contacted	Phone	Title

Previous Clients Contacted	Records Reviewed of Last Performance

Total Inspection Personnel: _____ Total Production Personnel: _____ Ratio: ____

Total QA/QC Personnel: QA _____ QC _____ Total Facility Personnel: _____
(Quality Program Review recorded on Evaluation Summary, Attachment 5-2)

Comments: _____

_____

_____

_____

_____

_____

Evaluations Conducted By: _____

_____

Evaluation Date(s): Start _____ End _____

Send completed form to the Organization evaluated and the Project Director, Design Manager or Resident Engineer.

EXAMPLE

TRIMET

Essential Elements of a Quality Program - Evaluation Summary

Summary Report No.: _____ Page ____ of ____

Organization: _____ Contract Number: _____

Essential elements of a Quality Program as defined by FTA QA/QC Guidelines, FTA-IT-90-5001-02.1

		Program		Accept		
Item	System Element	Yes	No	Yes	No	Comments
1	Organization					
2	QA Program and Documentation					
3	Design Control					
4	Document Control					
5	Purchasing, Equipment Procurement and Construction					
6	Control of Materials, Product Identification and Traceability					
7	Control of Special Processes					
8	Inspection and Testing Procedures					
9	Control of Measuring and Test Equipment					
10	Inspection and Test Status					
11	Nonconformance					
12	Corrective Action					
13	Quality Records					
14	Quality Audits					
15	Training					

Comments: _____

Evaluator(s): _____ Date: _____

Section 6 - Control of Materials, Product Identification and Traceability

6.1 Purpose
This section describes the procedure for control of materials, parts, and components used to construct the project.

6.2 Scope
These requirements apply to all materials incorporated into the project.

6.3 Policy
Procedures will be established to control materials and provide traceability to ensure that project materials and components are correct and free from defects.

6.4 Procedures
Suppliers and contractors for the project contracts will be required to include procedures for control of materials in their quality plan. These procedures must be sufficient to provide confirmation and documentation that the incorporated materials meet the quality requirements of the contract and that the provided materials are, in fact, the same ones that have been submitted, tested, or otherwise approved for use. The approved quality plan requirements shall also apply to lower-tier subcontractors and suppliers, if those entities do not have appropriate and acceptable quality procedures in-place. This evaluation shall be performed by the prime contractor/supplier.

Physical identification and control, through such means as identification markings, serial numbers, model numbers, lot numbers/tags, etc. will be used whenever possible. These identifications shall be referenced on quality control test and inspection documents to provide an auditable trail from fabrication or testing to installation on the project. Where physical identification is impractical, other means, such as physical separation and handling, will be used, TriMet Resident Engineers and their inspection staff will verify and document in Daily Inspection Reports that the items delivered and installed are as identified in applicable certifications and reports (i.e. qualification and functional test reports, data reports, nondestructive examination reports, first article inspections, etc.). Quality assurance will primarily be provided via the audit of these records. A surveillance of the process may also be utilized to ascertain the adequacy of this effort.

6.5 Responsibility
TriMet's design team (staff and consultants) is responsible for determination of the required quality requirements and standards for the materials included in the contract.

The supplier or contractor is responsible for including adequate material control procedures in its quality plan and is fully responsible for providing materials that conform to the contract documents.

The TriMet RE and inspection staff are responsible for verification of materials upon delivery.

The TriMet QAM is responsible for quality assurance audits and surveillances during the term of the contract.

6.6 Attachments

Not applicable

Section 7 - Control of Special Processes

7.1 Purpose
This section describes the procedure for control of special processes used to fabricate or otherwise process components used for the project.

7.2 Scope
These requirements apply to all components made or altered by special processes and subsequently incorporated into the system. Special processes include, but are not limited to such activities as welding, soldering, heat treating, plating and coating.

7.3 Policy
Special processes required in fabrication, production or installation that cannot be verified by subsequent inspection will be performed under controlled conditions. Contractors and suppliers will be required to describe their means of controlling special processes in their quality plans.

7.4 Procedures
Special process procedures must be sufficient to provide confirmation and documentation that the completed materials meet the quality requirements of the contract. The quality plan requirements shall also apply to lower-tier subcontractors and suppliers, if an adequate program is not in place for the lower-tier subcontractor or supplier.

Special processes will be accomplished and controlled by qualified personnel using approved procedures and/or instructions in accordance with applicable codes, standards or specifications, and as specified by the contract. Records of procedure qualification as well as personnel qualification and certification are to be maintained in the contractor's quality control files.

The qualifications of special process personnel and the use of adequate special process control procedures will be verified by the TriMet QA manager as part of the quality plan review. QA will be provided via audit of records, processes and activities.

7.5 Responsibility
The supplier or contractor is responsible for inclusion of special processes control procedures in its quality plan and ensuring that the finished product conforms to the contract documents.

The TriMet QAM is responsible for verification of the adequacy of the proposed control procedures and QA inspections and audits of special processes during the term of the contract.

7.6 Attachments
Not applicable

Section 8 - Inspection and Testing Procedures

8.1 Purpose
This section describes the procedures for planning, implementing and controlling inspection and test activities necessary to verify conformance to established design and contract requirements.

8.2 Scope
These requirements apply to all project material/equipment supply and construction activities requiring inspections and tests for quality.

8.3 Policy
Contract documents will contain requirements and standards for inspections and tests. Details on testing procedures will be further described in the contractor's Quality Plan and carried out accordingly.

8.4 Procedures
8.4.1 Quality Plans: Inspection and testing requirements will be included in the contract plans, specifications and identified standards. Suppliers and contractors for project contracts will be required to include procedures for quality control inspections and tests in their Quality Plans. These procedures must be in sufficient detail to provide assurance that the inspections and tests will be performed according to the contract requirements and standard industry practice. The Quality Plan's inspection and testing requirements shall also apply to lower-tier subcontractors and suppliers, if an adequate program is not in place for the lower-tier subcontractor or supplier.

Testing will include, as applicable: qualification tests, factory tests, first article inspections (FAIs), installation verification tests, testing frequency, material tests, demonstration tests, systems integration tests and pre-operation tests. In-process inspection shall be utilized in addition to final inspection whenever subsequent work will make replacement of faulty or rejected work or components impracticable.

Inspection and test plans must include specific inspection and test attributes, acceptance/rejection criteria and documentation requirements. Procedures are to be established for final acceptance of individual contract units and the entire system.

Inspection and test plans will be reviewed and accepted by TriMet's QAM prior to implementation.

Quality control inspections and tests are to be performed and documented by qualified personnel who are independent of those accomplishing the work. Hold or witness points will be identified and work will not proceed beyond those designated points until inspection is completed.

Final acceptance of any individual contract will include a review of all pertinent records and documents relating to quality, and will be performed after all required inspections and tests have been completed with acceptable results. Records of inspections and tests will be provided to TriMet and maintained in the TriMet RE's quality files.

8.4.2 Recordkeeping: TriMet REs and inspection staff will verify that the inspection and test requirements of the contract and the contractor's Quality Plan have been successfully carried out with acceptable results. Documentation will be received prior to acceptance and maintained in organized files. The Daily Inspection Report (DIR) described in the TriMet Inspectors Manual may be used to document field observations. Quality Assurance will be provided via audit of records, processes and activities.

8.5 Responsibility
TriMet's design team (staff and consultants) is responsible for determining the required inspections and tests and including these requirements in the contract documents.

The supplier or contractor is responsible for inclusion of inspection and test procedures in its quality plan and implementation accordingly.

The TriMet RE and inspection staff are responsible for verification of inspections and test results and collection of documentation.

The TriMet QAM is responsible for quality assurance audits during the term of the contract.

8.6 Attachments
Not applicable

Section 9 - Inspection, Measuring and Testing Equipment

9.1 Purpose
This section describes the requirements for controlling the performance of inspection, measuring and testing equipment (IM&TE).

9.2 Scope
These requirements apply to all inspection, measuring and testing equipment used for determining the quality of materials, equipment, parts, components, and services for the project.

9.3 Policy
Inspection, measuring and testing equipment is to be identified, controlled, and at specified periods calibrated and adjusted to maintain accuracy within required standards, in accordance with written procedures.

9.4 Procedures
Overall requirements for the control of inspection, measuring and testing equipment are to be determined and included in contract drawings and specifications. Contractors and suppliers must include procedures for controlling and calibrating their testing equipment in the Quality Plan for the contract.

Testing equipment will be controlled and uniquely identified by permanent marking or tagging. The equipment's control number shall be referenced in all test reports for tests made with that piece of equipment.

Equipment used for testing shall be calibrated according to the following requirements:

1. The standards used to perform calibration shall be based on National Institute for Standards and Technology (NIST) whenever possible. Other recognized sources may be used if more appropriate for the device and generally accepted as an industry standard.
2. Periodic recalibration shall be performed according to the same standard as the original calibration. Intervals of recalibration must be periodically reviewed and adjusted depending on usage, accuracy, required precision, and adjustment and maintenance history.
3. Equipment is to be marked with the due date of the next calibration.
4. Records of calibration dates and results of calibrations, which are directly traceable to the equipment, will be maintained and made available upon request.

If inspection or test equipment is found to be out of calibration, the validity of previous test results will be re-evaluated for acceptability. Inspection and tests performed with devices that were out of calibration shall be re-inspected or re-tested with properly calibrated equipment if so directed by TriMet at its sole discretion.

TriMet REs and inspection personnel will verify the calibration status of measuring and test equipment by surveillance of equipment and/or review of supporting documentation.

Records of verification of these procedural requirements will be maintained in the TriMet RE's files and may be included in Daily Inspection Reports.

9.5 Responsibility

The supplier or contractor is responsible for inclusion of test equipment control procedures in its quality plan and implementation of the requirements accordingly.

The TriMet RE and inspection staff are responsible for verification of proper equipment calibration and collection of necessary documentation.

The TriMet QAM is responsible for quality assurance audits during the term of the contract.

9.6 Attachments

Not applicable

Section 10 - Inspection and Test Status

10.1 Purpose
This section describes the requirements for communicating the status of tests and inspections throughout the course of the work.

10.2 Scope
These requirements apply to all supply and construction contracts requiring tests and inspections for quality control.

10.3 Policy
Identification of the status of tests and inspections during production and installation is required to ensure that only work that has passed inspections and tests is incorporated into the project.

10.4 Procedures
Requirements for testing and inspection are included in the contract drawings and specifications. Contractors and suppliers must include test and inspection procedures in their Quality Plan for the contract in accordance with Section 8 of this manual. The test and inspection procedures must include means and methods of communicating the current status of tests and inspections to TriMet to ensure that only acceptable components and materials have been provided.

Test and inspection status will be identified by means of markings, tags, labels, routing cards, records of results, physical location, or other suitable means. The status will indicate pass/fail history of previous tests and inspections.

TriMet REs and inspection personnel will verify that the appropriate test /inspection status is provided with delivered or installed materials in accordance with the approved Quality Plan.

10.5 Responsibility
The supplier or contractor is responsible for inclusion of test/inspection status procedures in its quality plan and implementation of these procedures accordingly.

The TriMet RE and inspection staff are responsible for verification of test/inspection status.

The TriMet QAM is responsible for quality assurance audits and surveillances during the term of the contract.

10.6 Attachments
Not applicable

Section 11 - Non-Conformance

11.1 Purpose
This section describes the requirements and procedures for identification and disposition of non-conforming work.

11.2 Scope
These requirements apply to all design, supply, construction, and installation contracts on the project.

11.3 Policy
A non-conforming items procedure will be implemented to ensure that non-conforming items are identified and controlled to prevent their use until adequate disposition is made. Final disposition of non-conforming items will require the approval of TriMet.

11.4 Procedures
11.4.1 General: Since the contractor (or supplier) is the primary party responsible for quality control, the contractor will identify and correct non-conforming items in accordance with the procedures in its approved quality plan. Guidelines for the execution of NCR documentation included in this section shall be addressed in the Contractor's Quality Plan. TriMet's RE, inspection staff and the QAM may independently identify non-conforming items that have inadvertently been overlooked or that the contractor believes are conforming. In these cases, the RE's office or the TriMet QAM will issue a TriMet Non-Conformance Report.

Non-Conformance Reports are controlled, uniquely numbered documents used to notify the contractor of a non-conforming item and used to monitor and document the remedial action. It is the contractor's responsibility to resolve the non-conformance issue to the satisfaction of the TriMet RE, and in some cases the project Designer of Record (DoR) or Engineer of Record (EoR) as well.

NOTE: A *Request For Information* (RFI) is a document generated by a designer/contractor to the owner or consultant to clarify a condition before work is performed. RFIs shall not be used to address nonconforming work.

11.4.2 Non-Conformance Report (NCR): A Non-Conformance Report will be prepared to record any non-conforming item. An example of the NCR form, along with instructions for its completion, is included as an attachment at the end of this section. At a minimum the contractor's form shall include all information contained on the TriMet form.

For NCR's generated by TriMet, the originator completes the top part of the NCR form describing the condition and proposed disposition and forwards it to the responsible contractor through the RE's office.

The contractor person(s) responsible for managing the remediation of the condition will investigate the cause of the non-conformance and documents its disposition and actions to prevent recurrence.

Options for disposition include:

- USE AS-IS: Accepting a non-conforming item as meeting the specification's intent. Requires approval/concurrence of the Designer of Record and/or the Engineer of Record
- REPAIR: Restoring an item to a condition that will make it acceptable for its intended use. Requires approval/concurrence of the Designer of Record and/or the Engineer of Record
- REWORK: Reprocessing an item to conform to the specified requirements
- REJECT: Removal of the non-conforming item from the project site

11.4.3 Tracking: Special control procedures will be utilized to track each NCR as follows:

- Each NCR will be uniquely numbered sequentially by contract. Numbers may consist of the CONTRACT NUMBER, YEAR and SEQUENCE NUMBER
- A log will be maintained for NCRs issued for each contract. An example of an NCR Log is located at the end of this section as an attachment
- Completed NCRs, including all back-up documentation, will be maintained by the TriMet RE as project quality records

11.4.4 Processing: Inspections will be conducted to verify that remedial actions have been accomplished in accordance with the disposition requirements of the NCR. Reworked or repaired items will be reinspected and/or retested in accordance with contract requirements.

The TriMet QAM will review each NCR to determine if the condition indicates a breakdown in the controls established in the Contractor's quality plan and to ensure that remedial actions and their implementation adequately resolve the problem. The TM QAM will trend each NCR item by contract. If a breakdown in the quality control process is determined to exist, the QAM will direct the issuance of a Corrective Action Request (CAR) by the Contractor's Quality Manager or the RE. Copies of the CAR will be forwarded to the CQCM, the TriMet RE and TriMet's QAM, as needed. (Refer to Section 12 of this Manual for further guidelines on processing CARs.)

11.4.5 Close-out: Resolution of discrepancies will be verified after implementation by the contractor. The Contractor's Quality Manager and the TriMet RE, or their designated representatives, will review the nonconforming condition to determine if the disposition status was adequately achieved. After verification, the NCR will be signed off by the RE/Inspector, distributed, filed and the appropriate log updated.

11.5 Responsibility

The contractor is responsible for initiating the NCR documentation process, implementing the agreed upon disposition of non-conforming items per the requirements of the NCR procedure and documenting the remediation through conclusion.

The TriMet RE, with the assistance of the inspection staff, is responsible for initiating the NCR process if the contractor does not, and coordinating review and disposition of each NCR. Support from the Designer of Record, the Engineer of Record, quality assurance, safety and others should be arranged as required. RE responsibility also includes tracking and close-out of NCRs per the above procedures.

The TriMet QAM is responsible for the review of all NCRs.

11.6 Attachments

11-1 Non-Conformance Report (NCR) with Instructions
11-2 Non-Conformance Report Log

TRIMET

EXAMPLE

Non-Conformance Report

Page _____ of _____

1. Contract No.	2. Location	3. Date	4. NCR No.
5. Contractor/Supplier	6. Specification/Drawing No.	7. Originator of NCR ☐ Contractor ☐ Owner ☐ DoR/EoR	

8. Non-Conformance Description:

9. Root Cause of Non-Conforming condition:

10. Responsible Person's proposed disposition

☐ Reject ☐ Repair* ☐ Rework* ☐ Use-As-Is * - Provide guidelines below for Repair or Rework process

_____

_____

_____

Date _____ Name (Print) _____ Title _____ Signature _____

11. Responsible person(s) proposal to prevent recurrence of unacceptable condition

12. Designer of Record (DoR) disposition of proposed remediation ☐ Accepted ☐ Rejected

Comments: _____

_____

Date _____ Name (Print) _____ Title _____ Signature _____

13. Engineer of Record (EoR) disposition of proposed remediation ☐ Accepted ☐ Rejected

Comments: _____

_____

Date _____ Name (Print) _____ Title _____ Signature _____

14. Owner's or Contractor's disposition of proposed remediation ☐ Accepted ☐ Rejected

Check the box(es) to the right if this condition could impact the project schedule or cost: ☐ Schedule ☐ Cost

Comments: _____

_____

Date _____ Name (Print) _____ Title _____ Signature _____

15. TriMet Quality Assurance *(ALL NCR items are tracked by TriMet QA for trending purposes.)*

NCR condition and proposed remediation have been noted. ☐ Yes ☐ No

Date _____ Name (Print) _____ Title _____ Signature _____

16. Responsible person(s) verification: Disposition completed. Item ready for re-inspection. ☐ Yes ☐ No

Date _____ Name (Print) _____ Title _____ Signature _____

17. RE or designated Inspector verification: Disposition completed. Item reinspected/acceptable. ☐ Yes ☐ No

Date _____ Name (Print) _____ Title _____ Signature _____

NON-CONFORMANCE REPORT FORM INSTRUCTIONS

Blocks 1 through 11 are completed by the Originator of the NCR document.

1 Enter the contract number.

2 Enter the location of the non-conformity (building, survey stationing, platform, turnout number...).

3 Enter the date the NCR was prepared.

4 Enter the unique NCR number obtained from the NCR log.

5 Enter the contractors, subcontractors, installers or suppliers complete name.

6 Enter the applicable specification section and paragraph or drawing number reference.

7 Check one box indicating whether the Originator is the owner, designer or the contractor.

8 Describe the nonconformance in detail. Provide brief description of contract requirements.

9 Describe the root cause of the non-conformance in detail (survey control, inspection oversight, manufacturing defect...).

10 Check one box indicating the proposed disposition for the non-conformity.

	Reject	Removal of the non-conforming item from the site.
*	Repair	Restoring or modifying an item to a condition that will make it acceptable for its intended use.
**	Rework	Reprocessing an item to conform to the specified requirements.
***	Use-As-Is	Accepting a non-conforming item as meeting the contract documents intent.

* This disposition requires concurrence from the Designer of Record and/or the Engineer of Record and a description of the proposed repair procedure.

** This disposition requires a description of the proposed rework procedure.

*** This disposition requires concurrence from the Designer of Record and/or the Engineer of Record.

11 Person(s) Responsible for Remediation proposal to prevent recurrence of this unacceptable condition. (Additional training in construction practices, increased inspection activity, removal of person performing deficient work...)

12 If determined to be applicable, Block 12 is completed by the Designer of Record's representative. This situation is more prevalent on Design/Build projects.
Mark the appropriate box indicating acceptance or rejection of the disposition proposed in Block 10.
If 'Rejected' is marked please provide a brief description of the basis for the rejection
Complete the date, name, title and signature entries in the block.

13 If determined to be applicable, Block 13 is completed by the Engineer of Record's representative, if (s)he is different from the Designer's representative.
Mark the appropriate box indicating acceptance or rejection of the disposition proposed in Block 10.
If 'Rejected' is marked please provide a brief description of the basis for the rejection
Complete the date, name, title and signature entries in the block.

14 REQUIRED - Block 14 is completed by the Owner's representative (if the NCR was generated by someone other than the owner) or Contractor's representative (if the NCR was generated by the Owner). Typically the owners representative is the Resident Engineer and the contractors representative is the Quality Control Manager.
Mark the appropriate box indicating acceptance or rejection of the disposition proposed in Block 10 and any subsequent conditions imposed by the DoR or the EoR representative(s).
The Owner shall also evaluate the NCR condition to determine if possible cost or schedule impacts (positive or negative) may occur due to this item.
If 'Rejected' is marked please provide a brief description of the basis for the rejection.
Complete the date, name, title and signature entries in the block.

15 REQUIRED - Block 15 is completed by the TriMet Quality Assurance Manager.
ALL NCR items are tracked by TriMet QA for trending purposes and possible issuance of a Corrective Action.
Complete the date, name, title and signature entries in the block.

16 REQUIRED - Block 16 is completed by the Person(s) Responsible for performing the remedial work.
Indicate if the non-conforming item has attained the disposition status proposed in Block 10, as agreed upon by the owner/DoR/EoR/contractor and is ready for reinspection, by checking 'Yes' or 'No'.
Complete the date, name, title and signature entries in the block.

17 REQUIRED - Block 17 is completed by the Resident Engineer or their designated inspector.
Indicate if the non-conforming item has attained the disposition status proposed in Block 10, as agreed upon by the owner/DoR/EoR/contractor and is ready for reinspection, by checking 'Yes' or 'No'.
Complete the date, name, title and signature entries in the block.

Upon completion of Block 17 the NCR document may be distributed and filed per document control guidelines.

TRIMET

EXAMPLE

Non-Conformance Report Log

Contract Name:_____

Contract Number:_____

Page _____ of _____

NCR No.	Description	Originator	Issued To	Date Issued	Date Due	Date Completed	Verified By	Date Verified	Date Closed

Section 12 - Corrective Action

12.1 Purpose
This section describes the requirements and procedures for implementing corrective actions when quality procedures are ineffective and repetitive non-conformances occur.

12.2 Scope
These requirements apply to all design, supply, construction and installation contracts on the project.

12.3 Policy
Corrective action procedures will be established for investigating the cause of non-conforming work items that are similar and become repetitive, analyzing the root causes, and initiating corrective actions. If corrective actions prove to be effective then changes to the Contractor's Quality Plan, to incorporate the corrective actions, shall be instituted.

12.4 Procedures
12.4.1 General: Corrective action procedures will be invoked when conditions indicate that a repetitive breakdown in controls for quality requirements has occurred. The contractor's quality organization, the TriMet RE, or TriMet's QAM may identify the need for a corrective action based on observations of work in progress. Identified need(s) for corrective action will be reported promptly to the responsible contractor quality staff, the TriMet RE and to the TriMet QAM.

12.4.2 Corrective Action Request (CAR) form. When the need for a corrective action is identified, the requestor will prepare, or cause to be prepared, a CAR form. An example copy of a CAR and instructions for its completion are included in the attachments to this section.

The CAR identifies the organization (name and address) to which the request is directed and the originator of the request. Additional information regarding the program, item location, and previous inspection/deficiency/nonconformance report numbers will be included as necessary. Dates of the request and reply due date are also established. A description of the condition requiring Corrective Action and a statement of apparent cause will be included on the CAR. The TriMet RE will track issued CARs through close-out.

Upon receipt of the CAR, the responsible organization will immediately evaluate the actions required and within ten (10) working days implement the following steps:

1. Determine the cause of the adverse condition(s)
2. Establish the corrective action required
3. Establish the action(s) needed to prevent recurrence
4. Revision and issuance of appropriate Quality procedures

The above actions will be documented on the CAR form and the form transmitted to the responsible Quality organization (prime contractor or TriMet). The responsible TriMet RE, with input from the quality assurance organization, will evaluate the corrective action being proposed and advise the responsible organization of the acceptability of the

actions. If the actions are unacceptable the TriMet RE or the TriMet QAM will meet with the responsible organization or elevate the problem to upper management.

12.4.3 Close-out: When corrective action activities are implemented and complete, the responsible TriMet RE and the quality assurance organization will evaluate results of the corrective action and close out the CAR. Copies of the closed CAR will be distributed to the prime contractor (if applicable), the TriMet RE, and the TriMet QAM. CARs originated by the TriMet QAM or the TriMet RE will be routed to the prime contractor for concurrence in the disposition. Once the corrective action has been successfully implemented, the new process or procedure shall be incorporated into the contractor's Quality Plan as standard practice to prevent future occurrences of the same nonconformance on the project.

12.5 Responsibility

The contractor is responsible for implementing the corrective actions and incorporating them into its quality plan.

The TriMet RE, with the assistance of the inspection staff, is responsible for tracking issued CARs and concurring in effective implementation per the above procedures.

The TriMet QAM is responsible for concurring in corrective actions per the above procedures.

12.6 Attachments

12-1 Corrective Action Request (CAR) with Instructions
12-2 Corrective Action Request Log

TRIMET

EXAMPLE

Corrective Action Request

Page _____ of _____

1. Contract No.	2. Item Location	3. Issue Date	4. CAR No.

5. Responsible Organization	6. Specification/Drawing No.	7. Originator of CAR ☐ Contractor ☐ Owner

8. Previously Issued Deficiency Notices, NCRs or AFRs	9. Response Date	10. Reviewed By (Supervisor)

11. Description of Recurring Condition and Contract Requirement _____

12. Root Cause of Problem _____

13. Action Taken to Prevent Recurrence _____

14. Response Prepared By	15. Response Date	16. CAR Proposed Implementation Date

17. RE Disposition ☐ Acceptable ☐ Unacceptable	18. Signature Date

19. Verification of Corrective Action _____

20. QA Disposition ☐ Acceptable ☐ Unacceptable	21. Signature Date

22. Verification of Corrective Action _____

CORRECTIVE ACTION REQUEST FORM INSTRUCTIONS

Blocks 1 through 11 are completed by the Originator.

1 Enter the contract number.
2 Enter the location of the incident, material, hardware, etc.
3 Enter the date the CAR is prepared and issued.
4 Enter the unique CAR number obtained from the CAR log.
5 Enter the contractors, subcontractors, installers or suppliers complete name.
6 Enter the applicable specification section and paragraph or drawing number reference.
7 Check one box indicating whether the Originator is the contractor or the owner.
8 Reference the previously issued Deficiency Notices (DNs), Non-Conformance Reports (NCRs) or Audit Finding Reports (AFRs). (If an AFR is referenced, the appropriate Finding Number shall also be noted.)
9 Enter the date the reply is due back to the Originator. (Normally this is ten working days after the date of issue.)
10 Signature of the Originator's supervisor or manager.
11 Provide a description of the recurring deficient condition and the applicable standard from the contract documents.

Blocks 12 through 16 are to be completed by the individual or organization responsible for responding to the CAR.

12 Describe the root cause(s) for the issuance of the original deficiency paperwork and the CAR document.
13 Describe the corrective action, action to prevent recurrence, or action necessary to correct the deficiency.
14 Signature of the individual preparing item No. 12.
15 Enter the date the response in Block 13 was completed.
16 Enter the proposed effective date of the CAR implementation.

Blocks 17 through 19 will be completed by the Resident Engineer.

17 Review the proposed resolution and check the appropriate box.
18 Signature and date of the individual assigning a status to Block 17.
19 Enter a brief explanation of why the Corrective Action was determined to be acceptable or rejected.

Blocks 20 through 22 will be completed by the TriMet Quality Assurance Manager.

20 Review the implemented resolution and check the appropriate box.
21 Signature and date of the individual assigning a status to Block 20.
22 Enter a brief explanation of why the Corrective Action was determined to be acceptable or rejected.

When the CAR is closed/completed:

The original remains in the RE files.
A copy is sent to the TriMet QA Manager.

TRIMET

EXAMPLE

Corrective Action Request Log

Contract Name:_____

Contract Number:_____

Page _____ of _____

CAR No.	Description	Originator	Issued To	Date Issued	Date Due	Date Completed	Verified By	Date Verified	Date Closed

Section 13 - Quality Records

13.1 Purpose
This section describes the requirements for production, collection, filing and maintenance of quality assurance and quality control records, collectively referred to as quality records.

13.2 Scope
These requirements apply to all quality records for the contract, including its design, procurement, construction, installation, inspection and test activities.

13.3 Policy
Written records of quality activities will be prepared, compiled and stored in a retrievable manner.

13.4 Procedures
Quality records will be collected, stored and preserved in a manner that precludes damage, loss or deterioration. Quality records may be in the form of either hard copy or electronic files. Quality records will be identified by title, contract number, revision, activity description, date and signature, as appropriate.

Quality records shall be maintained to demonstrate conformance to quality-related requirements and the effectiveness of the quality system. They will be available to authorized persons at any time when requested within a reasonable timeframe. A duplicate set (hardcopy or electronic) of the records shall be kept separate from the working files maintained by the Resident Engineer's office during construction.

Quality records are categorized as Non-Permanent Records. Retention time shall be as required by applicable law and in accordance with Capital Projects Division business procedures.

Quality records are subject to quality assurance audits.

Contractor/suppliers are also responsible for retention of their quality records throughout the period of construction, assembly and/or installation, and testing in accordance with these requirements.

Whenever possible, storage facilities for quality records should include fire resistant steel file cabinets or other storage containers located within an area having features that preclude damage from fire, condensation, and extreme temperature variation. In lieu of fire resistant files a second (backup) copy of each quality record should be maintained in an area remote from the primary storage area described above.

TriMet project staff performing quality activities are responsible for maintaining quality records in accordance with this section.

Unless otherwise stated in the contract, the Contractors quality records will be turned over to the TriMet RE at the completion of the contract for placement into the archives per guidelines set forth in the Capital Projects Division *Business Procedures Manual (BPM)*.

13.4.1 Quality Records
Examples of quality records include:

13.4.1.1 Design Records
- Quality Plans
- Applicable Criteria Used in Design
- Design Calculations and Checks
- Drawings (Standards, Preliminary Engineering, Final Design, Issued For Construction, Reference, Directive, Contract, As-Built, Shop, Working, etc.)
- Design Review Report
- Contract Specifications (Preliminary Engineering, Final Design, Issued For Construction, etc.)
- Quality Assurance Audit Reports

13.4.1.2 Procurement Records
- Procurement Procedures and Manuals
- Surveillance Inspection Reports
- Pre-Award Surveys
- Certificates of Compliance
- Test Results

13.4.1.3 Construction. Manufacturing, Installation Records
- Quality Plans
- Process and Personnel Certifications
- Contractor Data Submittals
- Daily Inspection Reports, Surveillance Reports, First Article Inspections (FAIs)
- Test Witness Reports
- Material Certifications
- Test Reports and Data
- Nonconformance Reports (NCRs)
- Corrective Action Requests (CARs)
- Quality Assurance Audit Reports
- System Safety Certification Documentation

13.4.1.4 Start-Up Records

13.5 Responsibility
Designers, consultants and contractors are responsible for establishing and maintaining a comprehensive set of quality records. This section shall be addressed in their approved quality plan.

The TriMet RE is responsible for preparing, assembling and maintaining all quality records for archiving. While the files are in the possession of the RE, accessibility and retrievability of the documents must also be controlled. (Upon placement into the TriMet archives, retrievability will become a function controlled by the Capital Projects Division *Business Procedures Manual*.)

The TriMet QAM will perform audits of quality records.

13.6 Attachments

Not applicable

Section 14 - Quality Audits

14.1 Purpose
This section describes the requirements for performing quality audits and surveillances of project activities.

14.2 Scope
These requirements apply primarily to Quality Assurance audits of Contractor quality activities, performed principally by TriMet's Quality Assurance staff (or consultants) relative to overall project quality activities. Consultants and contractors performing internal quality audits as part of their Quality Plans may use this procedure or submit one of their own which meets these requirements.

14.3 Policy
A program for planned, periodic audits will be established to ensure full implementation of the Division's QA Program and the Contractor's Quality Plans. Formal audit findings will be prepared and reviewed with the affected project participants and maintained in quality records for review by the FTA and others.

14.4 Procedure
14.4.1 Audit General: A comprehensive program of planned, periodic audits will be established to verify that the QAPM and Quality Plans are acceptable and have been developed, documented and effectively implemented in accordance with specified requirements. The activities of consultants, contractors, and critical suppliers may be audited for compliance and implementation of contractually required quality activities, including an evaluation of the overall program effectiveness.

An auditor will be assigned for each audit performed and is responsible for all elements of the audit. Audit personnel are to have no direct responsibility in the activities to be audited. Auditors will have experience or training commensurate with the scope, complexity, or special nature of the activities to be audited. Auditors will be given access to all records necessary to identify problems, recommend solutions, and evaluate corrective actions.

This section also includes information for Quality Assurance assessments of daily activities performed by the TriMet RE offices.

14.4.2 Audit Scheduling: Audits and assessments will be scheduled and performed on a frequency commensurate with the type and pace of the subject activities and as indicated by previous audits. Closeout audits, to verify completion and the effectiveness of any remedial actions, will be scheduled as required. A formal QA Audit Schedule will be maintained by the TriMet QAM. An example audit schedule format is included in the attachments at the end of this section. Other schedule formats may be developed and utilized. Scheduling of the audit activity will be performed through the respective TriMet RE's office, or directly with the organization to be audited, in concurrence with the RE.

14.4.3 Audit Process: The format for planning and conducting an audit is as follows:

1. The auditor shall assemble and review all appropriate reference documentation (contracts, specifications, standards, drawings, approved quality plans, etc.) and prepare an audit plan and checklist. The plan should include a description of the activity, the organization to be audited, activities to be audited, scheduled audit date(s), auditor's name and an appropriate audit checklist. This audit plan will be in the form of a Memo or electronic mail forwarded to the organization to be audited at least five (5) to ten (10) working days in advance of the audit. The RE's office shall be copied on any correspondence forwarded to the contractor(s).

2. A pre-audit conference will be held to discuss the audit plan, scope, dates, process, or otherwise establish the ground rules for the conduct of the audit. This pre-audit conference may be held immediately prior to the audit to allow for any necessary introductions between participants.

3. Attendees at the audit shall include the following: The auditor, representatives from the TriMet QA staff and the appropriate Contractor/Designer/Supplier Quality Manager. Attendance from the TriMet Resident Engineer's staff is optional.

4. The auditor will conduct the audit in accordance with the plan and checklist. Example audit checklists have been developed and are included at the end of this section. A specific audit checklist should be developed for each approved quality plan for a contract. Audit checklists are developed to provide the auditor with a vehicle to make notations about the audit. The audit report, comprised of a brief summary, completed checklists, related forms, etc., will be distributed and filed per Section 4 of this manual. The audit activities will generally include:
   - A review of documentation for compliance with the quality procedures
   - Interviews conducted with individuals who perform specific activities relating to quality to ascertain that they have a proper understanding of the required procedures
   - Review of operations associated with the audit item including the witnessing of operations to determine adherence to written procedures
   - Auditors will determine the level of sampling required

5. The auditor will complete the audit checklist and prepare an Audit Finding Report (AFR) for the audit elements requiring remedial action (i.e. a 'finding'). Multiple findings may be included on a single AFR form. Audit findings are items that are directly inconsistent with the quality procedures or contract documents. Recommendations may also be included on the AFR form. Recommendations are items that, while not in direct violation of a quality procedure or contract document, may improve the overall effectiveness of the Quality process. If an AFR Is not issued for an audit activity, but recommendations exist, they may be included on the audit checklist or in the summary. Examples of an Audit Finding Report and instructions for the completion of the form have been included as attachments at the end of this section.

6. Upon completion of the audit, the auditor will conduct an informal post audit conference with management and supervision in the areas audited to review the audit results. The purpose of this review is to confirm the conditions found, resolve any misunderstandings with respect to observed deficiencies and to establish remedial action commitments.

7. After the post audit conference, the auditor will prepare an audit summary in conjunction with the audit checklist, detailing the documents reviewed, individuals interviewed, the operations or activities reviewed, noting the acceptable or non-acceptable areas observed. Any associated Audit Finding Report forms will be included with the report issued to the TriMet Design Manager or RE, for distribution to the audited organization.

The management of the audited organization will be required to respond to the audit report within fifteen (15) working days after receipt of the narrative and the AFR. Circumstances may arise where responses require additional time or further clarification. Such instances will be resolved directly with the auditor and appropriately documented. TriMet's QAM is responsible for accepting or rejecting responses to audit finding reports. The reason for rejection will be stated in writing.

The auditor is responsible for scheduling follow-up audits as needed, to verify the completion and effectiveness of remedial actions. Deficiencies that continue to exist after the closeout audit may be closed to an appropriate document, such as a Nonconformance Report, or remain open on the AFR to be addressed during a follow-up audit activity. Every reasonable effort will be made to close out audit findings on the AFR that they originated on.

14.4.4 Audit Records: Audit records are to be maintained and included as project quality records and made available for review. Records include audit schedules, audit plans, audit reports, audit checklists, audit performance records, and Corrective Action Requests, as applicable.

14.4.5 Surveillances: Surveillances are less formal review activities than an audit, performed to observe and evaluate specific field or office quality oriented activities and processes. They are performed on an irregular basis/schedule and are intended to focus on singular activities. A Surveillance Report (see *14.6 Attachments*) may be generated to provide a written record of an activity that a quality representative observes or discusses with contractor or TriMet personnel. (Ex. Reviews of TriMet Closeout Binders are typically documented on a Surveillance Report.) Completed Surveillance Reports are filed and logged by the QA Manager.

14.5 Responsibility

The contractor, designer or consultants quality manager shall perform audits on the subcontractors or subconsultants and suppliers assigned to the project. The quality manager shall also schedule and cause regularly scheduled internal audits to be performed of their quality programs. A senior level member of the contractor's staff who is not assigned to the project shall perform these internal audits.

The TriMet QAM is responsible for performing, or having performed, quality assurance audits/surveillances of the contractors and the RE's activities in accordance with these requirements.

14.6 Attachments

14-1 Quality Assurance Audit Schedule
14-2 Design Activity Audit Checklist
14-3 Construction Activity Audit Checklist
14-4 Resident Engineer Records Assessment Checklist
14-5 Audit Finding Report (AFR) Form with Instructions
14-6 Quality Assurance Audit Log
14-7 Surveillance Report

TRIMET

EXAMPLE

Quality Assurance Audit Schedule

Page _____ of _____

Activity	20____ Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Prepared By: _____ Date: _____

Approved By: _____ Date: _____

TRIMET

Design Activity Audit Checklist

EXAMPLE

Designer and Contract No.	Date of Activity:	Audit No.

	Quality System Components	Ref.	Y	N	Comment #	Result M-Meets F-Finding R-Recomm	Status O-Open C-Closed
1. Management Responsibility							
A	Current Design Consultant Organization Chart	TM QAM					
B	Management signatures obtained per approved Design Quality Plan (DQP)	TM QAM					
2. Quality Program and Documentation							
A	Design Consultant has an approved DQP	TM QAM					
B	Sub consultants have an approved DQP	TM QAM					
C	Process provides a clear-cut audit trail	TM DC/L					
3. Design Control							
A	TriMet Design Criteria Manual available	TM QAM					
B	Exceptions to TriMet Design Criteria according to TriMet change process	TM QAM					
C	Drawings/specifications transferred to TriMet utilizing the EDMS	TM DC/L					
D	Design review procedures established	TM QAM					
E	Design Meetings being held on a regular basis according to the DQP	TM DC/L					
F	TriMet/Stakeholder design comments dispositioned and completed	TM DC/L					
4. Document Control							
A	Documented filing procedures	TM QAM					
B	Documented procedures to maintain quality control and quality assurance records	TM QAM					
C	Revised technical specifications submitted with construction review packages	TM DC/L					
5. Purchasing, Equipment Procurement and Construction							
A	Subcontractor, to include vendor and supplier, evaluation and selection based on:						
1	Review of quality program	TM QAM					
2	Review of records of past performances	TM QAM					
3	Facility survey and reference checks	TM QAM					
4	ISO 9000 documentation	TM QAM					
6. Control of Materials, Product ID and Traceability		***NOT USED***					
7. Control of Special Processes							
A	Design Calculations						
1	All reviewers qualified according to official contact documents	TM QAM					
2	Signed & Sealed by OR Registered PE	TM DC/L					
3	Format elements include required fields per DQP	TM DC/L					
4	Design Check has been completed (prior to Issued For Construction)	TM DC/L					
5	Process provides a clear-cut audit trail						
6	Plan folders maintained in a central, accessible location	TM DC/L					
B	Stamps are identified as 'In-Progress' or 'Check' print	TM DC/L					
1	Dates and signatures chronological	TM DC/L					
C	Index descriptions match the drawing title block	TM DC/L					
D	Color Code system being utilized According to auditee's DQP (Attached list)	TM DC/L					
E	Revised technical specifications annotated with redline and strike-out notations	TM DC/L					
F	All checkprints and checked copies retained as quality records						
8. Inspection and Testing Procedures		***NOT USED***					
9. Inspection, Measuring and Testing Equipment (IM&TE)		***NOT USED***					
10. Inspection and Test Status		***NOT USED***					

Designer and Contract No.	Date of Activity:	Audit No.					
Quality System Components		Ref.	Y	N	Comment #	Result M-Meets F-Finding R-Recomm	Status O-Open C-Closed
11. Non-Conformance							
A	NCR form includes TriMet signature sections (RE/QA)	TM QAM					
B	Each NCR is uniquely numbered	TM QAM					
C	Backup documents are attached in support of the NCR resolution	TM QAM					
D	Remediation process in place according to approved quality plan	TM QAM					
E	Nonconformance Reports tracked on NCR Log	TM QAM					
F	NCR's resolved on a timely basis						
12. Corrective Action							
A	Corrective Action process established	TM QAM					
B	Corrective Action(s) implemented according to auditee's approved quality plan						
C	CARs tracked on a CAR Log						
13. Quality Records							
A	Consultants responsible for retention of Quality Records	TM QAM					
B	Maintained in physical files showing design evolution	TM QAM					
C	Design calculations and verifications maintained	TM QAM					
D	Records established and maintained according to approved DQP	TM QAM					
14. Quality Audits							
A	QM performs audits of Designer - Last Audit performed: **[/ / 201x]**	TM QAM					
B	QM performs audits of sub Designers - Last Audit performed: **[/ / 201x]**	TM QAM					
C	Audit findings addressed and resolved in timely manner						
15. Training							
A	Personnel have read and acknowledged the QPM	TM DC/L					
B	Documented procedures to identify training needs for each individual	TM QAM					
C	Training of primary staff completed and documented	TM QAM					
D	Training of subconsultant staff completed and documented						

COMMENTS

1

2

3

4

5

6

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8

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10

TRIMET

Construction Activity Audit Checklist

EXAMPLE

Contractor and Contract No.	Date of Activity:	Audit No.

	Quality System Components	Ref.	Y	N	Comment #	Result M-Meets F-Finding R-Recomm	Status O-Open C-Closed
1. Management Responsibility							
A	Current Contractor Organization Chart	TM QAM					
B	Management signatures obtained per approved Construction Quality Plan (CQP)	TM QAM					
C	Monthly invoices/Completion Certificates are certified by the QCM	TM DC/L					
2. Quality Program and Documentation							
A	Contractor has an approved CQP	TM QAM					
B	Sub contractor(s) have an approved CQP	TM QAM					
C	Process provides a clear-cut audit trail	TM DC/L					
3. Design Control							
A	Distribution and management of IFC documents is appropriate	TM QAM					
B	Redlined/controlled (drawings/Specs) are managed appropriately	01400					
C	Drawings/specifications transferred to TriMet and updated through EDMS	TM QAM					
4. Document Control							
A	Documented filing procedures	TM QAM					
B	Documented procedures to maintain quality control/quality assurance records	TM QAM					
5. Purchasing, Equipment Procurement and Construction							
A	Subcontractor, to include vendor and supplier, evaluation and selection based on:						
1	Review of quality program	TM QAM					
2	Review of records of past performances	TM QAM					
3	Facility survey and reference checks	TM QAM					
4	ISO 9000 documentation	TM QAM					
6. Control of Materials, Product Identification and Traceability							
A	A Material Receiving Log has been established and is maintained current	01400					
B	Items for incorporation into the Work are verified as the approved products	TM QAM					
C	Materials are marked as acceptable/not acceptable for use in the Work	TM QAM					
D	Materials stored on-site are stored per the manufacturers guidelines	TM QAM					
7. Control of Special Processes							
A	Special processes have been identified in the CQP	TM QAM					
B	Special processes are being accomplished/controlled by qualified personnel, etc.	TM QAM					
C	Records of procedure/personnel qualifications are maintained as quality records	TM QAM					
8. Inspection and Testing Procedures							
A	In-process inspection is being performed before subsequent work	TM QAM					
B	Personnel performing tests/inspections are qualified and independent of production	TM QAM					
C	Hold/witness points are identified and documented accordingly	TM QAM					
D	Documentation is being maintained as quality records (i.e. part of the DIR)	TM QAM					
9. Inspection, Measuring and Testing Equipment (IM&TE)							
A	IM&TE is identified and managed on a Log, to include calibration status	TM QAM					
B	IM&TE is uniquely identified (labels, markings, etc.)	TM QAM					
C	Calibration certs are traceable to the equipment and maintained as quality records	TM QAM					
D	Out of calibration IM&TE is managed accordingly	TM QAM					
10. Inspection and Test Status							
A	Inspection and test status is being maintained by suitable means (tags, records, etc.)	TM QAM					
B	Insp/test statuses shall indicate pass/fail history of previous tests/inspections	TM QAM					

Contractor and Contract No.	Date of Activity:	Audit No.

	Quality System Components	Ref.	Y	N	Comment #	Result M-Meets F-Finding R-Recomm	Status O-Open C-Closed
11. Non-Conformance							
A	Each NCR is uniquely numbered	TM QAM					
B	Backup documents are attached in support of the NCR resolution	TM QAM					
C	Remediation process in place according to approved quality plan	TM QAM					
D	Nonconformance Reports tracked on NCR Log	TM QAM					
E	NCR's resolved on a timely basis						
12. Corrective Action							
A	Corrective Action(s) implemented according to auditee's approved quality plan	TM QAM					
B	CARs tracked on a CAR Log	01400					
13. Quality Records							
A	Records established and maintained according to approved CQP	TM QAM					
B	Retention periods have been defined for quality records	TM QAM					
C	Quality records shall include: Process/personnel qualifications, plans, submittals, DIRs, FAIs, surveillances	TM QAM					
D	A backup copy of quality records is maintained separate from the primary set	TM QAM					
14. Quality Audits							
A	QM performs audits of Contractor - Last Audit performed: **[/ / 201x]**	TM QAM					
B	QM performs audits of sub Contractors - Last Audit performed: **[/ / 201x]**	TM QAM					
C	Audit findings addressed and resolved in timely manner						
15. Training							
A	Personnel with quality functions (eng/mgrs) have read and acknowledged the CQP	TM QAM					
B	Documented procedures to identify training needs for each individual	TM QAM					
C	Training of primary staff completed and documented	TM QAM					
D	Training of subcontractor staff completed and documented	TM QAM					

COMMENTS
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TRIMET

Resident Engineer
Records Assessment Checklist

EXAMPLE

Resident Engineer and Contract No.	Date of Activity:	Review No.

	Program Components	Ref.	Y	N	Comment #	Result M-Meets F-Finding R-Recomm	Status O-Open C-Closed
A. Overview		*Not Used*					
B. Organization							
1	Project Team and Responsibilities Established	B.1					
a	Director (Project or Segment)	B.1					
b	Resident Engineer, Assistant Resident Engineer	B.1					
c	Office Manager/Admin Asst	B.1					
d	Technical Staff - Field Engineer, Office Engineer, Project Engineer, Inspectors	B.1					
e	Shared Resource - Safety, Quality, Estimating, Scheduling, Systems, Comm Affairs, Art	B.2					
f	Consultants (Structural, Civil, Systems)	B.2					
C. Resident Engineer's Role							
1	Pre-Construction (Kick-off Meeting) - Held after Notice of Award	C.2					
2	Partnering (if applicable)	C.3					
3	Additional Construction Phase Responsibilities	C.4					
D. Correspondence							
1	Document Control (DocC) numbering is being utilized (mandatory)	D.1.1					
2	Work Breakdown Structure (WBS) Master File Code is being utilized (mandatory)	D.1.2					
3	Subject field information is being consistently provided (mandatory)	D.1.3					
4	Correspondence assembly and handling guidelines are being followed	D.2					
5	Handling of incoming project documentation (non-project, project, email) is IAW REM	D.3					
6	Forms (Letter of Transmittal)	D.4					
E. Contacts with the Public							
1	RE Office manages visits by off-site personnel accordingly	E.1					
2	Response to complaints (noise, vibration, housekeeping, environmental, etc)	E.2					
3	Community Affairs coordination	E.3					
4	Forms (Project Visitor Log, Hold Harmless Agreement)	E.4					
F. Records and Reports							
1	Construction photography practices are in place (DIRs must still be used)	F.5					
2	Meeting minutes are being maintained/distributed/filed (Weekly, Special Coord., others)	F.6					
3	Record Documents	F.7					
a	RE maintained as-built documents are being properly managed	F.7.1					
b	Superseded documents are being properly managed	F.7.2					
c	Contractor as-built documents are being monitored	F.7.3					
4	Permit records are being maintained accordingly	F.8					
5	Contract labor reporting (Registration in program, wage/hour, EEO, DBE)	F.10					
6	Forms (Daily Log, Labor Standard Interview)	F.11					
G. Quality Assurance and Quality Control							
1	Day-to-day oversight/monitoring of quality activities - QMP	G.3					
2	Inspection, test and daily reports (external/internal) - reviewed and filed (follow-up as needed)	G.4					
3	Management of NCR/CAR conditions (tracking, final disposition, etc)	G.5					
4	Inspection and testing frequency - established, monitored, etc.	G.6					
5	Confidence (QA) testing implemented through on-call IMTL	G.6					
6	Forms (Non-Conformance Report)	G.7					
H. Safety							
1	Safety Policy and Safety Program are both evident in field office	H.1-2					
2	Day-to-day oversight of contractor safety activities (JHAs, Safety Plan, PTA, etc.)	H.3					
3	TM responsibilities - Minutes, JHAs, Track Access	H.4					
4	Emergency notification and media relations during an incident	H.4.6					
5	Safety certification development, coordination and execution	H.5					
6	Forms (Incident Report, JHA, PTA Card)	H.6					
I. Owner Controlled Insurance Program							
1	Ongoing coordination between OCIP Mgr and RE	All					

Resident Engineer and Contract No.	Date of Activity:	Review No.					
Program Components		Ref.	Y	N	Comment #	Result M-Meets F-Finding R-Recomm	Status O-Open C-Closed
J. Execution of Work							
1	Project constructed in accordance with the plans and specifications	J.1					
2	Work stoppages enacted by RE	J.2					
3	Archaeological resources are managed appropriately	J.3					
K. Scheduling							
1	Review and acceptance of the contractors baseline schedule (input from Sched Engineer)	K.2					
2	Ongoing review/evaluation of 3-week/progress schedules at regular intervals	K.2					
L. Submittals							
1	Submittal management is consistent with delineated guidelines	L.2					
2	Forms (Submittal Transmittal, Document Review Comment Form, Substitution Request)	L.4					
M. Progress Payments							
1	Schedule of Values is managed accordingly and consistent with the Bid Schedule	M.1					
2	Monthly Invoices (Progress Payments) are managed appropriately	M.3					
3	Payment for materials before installation is being executed	M.4					
4	Payment for Overruns/Underruns	M.5					
5	Payment for Change Orders (CO)	M.6					
6	Retainage amounts coordinated/reviewed with Prog Mgmnt	M.7					
7	Forms (Invoice Summary, Approval for Payment, Request for Payment for Materials Prior to Installation, Checklist for Retainage (Reduction, Partial Release, Final Release))	M.9					
N. Changes							
1	PC files are maintained current and complete (OOM estimate, FCE, T&M, etc.)	N.1-2					
2	RFIs are being managed per the guidelines	N.3.4					
3	Response timeframes for reviewing changes are acceptable	N.7					
4	COs are being managed per the guidelines	N.11					
5	Cost recovery due to design errors has been pursued by the RE	N.12					
6	Prolog is being used to track RFIs, PCs and COs	N.1,3.4,11					
7	Change work is being properly tracked	N.14					
8	Forms (Change Order, Change Order Transmittal, Change Control Board Checklist, Daily Force Account Record, Request For Information, Clarification Letter/Form)	N.15					
O. Surveying							
1	Survey controls are being checked	O.2					
2	Surveying field notebooks are being maintained by TriMet (if applicable)	O.2					
P. Public Art							
1	Coordination with the Public Art Manager as necessary (schedule, submittals, quality, payments)	All					
Q. Construction Claims							
1	Management of Notices of Intent to Claim and claims avoidance activities	All					
R. Disputes							
1	Dispute resolution management efforts follow the guidelines provided	All					
S. Contract Closeout							
1	Appropriate management of:						
a	Substantial completion (including certificates and timelines)	S.2					
b	Punchlist - establishment and resolution	S.3					
c	Milestone date inspections	S.4					
d	Final completion and acceptance of construction work	S.5-6					
e	Final payment and final release of retainage	S.8-9					
f	Transfer of RE records (base contract documents, closeout binder, archival docs)	S.10					
g	Record documents (drawings and specifications)	S.11					
h	Project transfer to other TriMet Divisions (punchlist, safety cert, training, parts, O&M manuals, as-builts)	S.16					
2	Forms (Affidavit of All Bills Paid and Indemnity, Certificate of Substantial Completion, Certificate of Final Acceptance, Unconditional or Conditional Waiver and Release Upon Final Payment - Contractor/Subcontractor/Supplier, Final Release of Retainage, Certificate of Contract Closeout, Project Turnover Checklist, Turnover Items Delivery)	S.17					

COMMENTS
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3

TRIMET

EXAMPLE

Audit Finding Report (AFR)

1. Project/Contract/Supplier:	2. Location:		3. AFR No.:
4. Subject:	5. Audit Number:	6. Discussed With:	7. Issue Date:
8. Responsible Authority: Phone Number:		9. Auditor Phone Number:	
10. Requirement Reference and Description of Condition:			
11. Cause(s) of the Problem:			
12. Remedial Action(s):			
13. Responsible Authority:	14. Response Due Date:	15. Response Date:	16. Effective Date:
17. Remedial Action(s): ☐ Accept ☐ Reject		18. Auditor: Date:	
19. Verification of Remedial Action(s):			
20. Implementation: ☐ Accept ☐ Reject		21. Auditor: Date:	

AUDIT FINDING REPORT FORM INSTRUCTIONS

Blocks 1 through 10 and 14 will be completed by the Auditor or individual issuing the AFR prior to issuance as follows:

1 Enter the name of the project, contract or supplier.
2 Enter the location of the project, contract or supplier.
3 Enter the AFR document number (This should match the audit number that was performed.)
4 Enter the subject of the Audit (i.e. Document Control, Submittal Control, etc.)
5 Enter the Audit Number.
6 Enter the name of the primary auditees attending the audit.
7 Enter the issue date of the AFR.
8 Enter the name and telephone number of individual responsible for responding to the AFR.
9 Enter the name(s) and telephone number(s) of the individual(s) issuing the AFR.
10 Describe each finding by identifying the contract reference, the requirement(s) and the existing condition(s).
(Recommendation items are included to improve the effectiveness of the contractor's quality program and do not require a formal response or action.)
14 Enter the response due date (normally 15 working days after date of issue).

Blocks 11 through 13, 15 and 16 will be completed by the individual responsible for responding to the AFR.

11 Enter the cause(s) of the problem for each finding.
12 Enter the remedial action/action to prevent recurrence of the condition for the finding.
13 Signature of individual responsible for responding to the AFR.
15 Enter the response date.
16 Enter the date that the remedial action/procedure will become effective.

Blocks 17 through 21 will be completed by the individual issuing the AFR.

17 Check the appropriate box.
18 Signature of the Auditor and the date confirming that proposed remedial action(s) are acceptable.
19 Enter the activities performed to verify remedial actions have been performed.
20 Check the appropriate box.
21 Signature of Auditor and date that the AFR has been closed.

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EXAMPLE

Quality Assurance Audit Log

Audit Number	Contract Number	Subject	Audit Dates	Lead Auditor	Report Issued to RE	Response Due Date	Response Received	Follow-Up Audit Scheduled	Comments

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EXAMPLE

Quality Assurance Surveillance Report

Project/Contract:	Surveillance Performed By:
Contractor/Subcontractor/Supplier:	Date of Surveillance:
Physical Location of Item(s) Reviewed	

Item(s) Reviewed (Mark all that apply)

Contract Phase

☐ Preliminary Engineering ☐ Final Design ☐ Construction ☐ Other: _____

Activity

- ☐ Management Responsibility
- ☐ Quality Program and Documentation
- ☐ Design Control
- ☐ Document Control
- ☐ Purchasing, Equipment Procurement and Construction
- ☐ Control of Materials, Product Identification and Traceability
- ☐ Control of Special Processes
- ☐ Inspection and Testing Procedures
- ☐ Inspection, Measuring and Test Equipment
- ☐ Inspection and Test Status
- ☐ Non-Conformance
- ☐ Corrective Action
- ☐ Quality Records
- ☐ Quality Audits
- ☐ Training
- ☐ Other: _____

Description of Item(s) Reviewed (continue on page 2 if necessary):

Reviewers Name (Please Print)	Reviewers Signature	Date:
_____	_____	_____

Quality Assurance
Surveillance Report
(continuation)

Project/Contract:	Date of Surveillance:
Surveillance Performed By:	
Description of Item(s) Reviewed: (Continued)	
Concerns Noted or Discussed with On-Site Personnel or PMOC:	
Follow-up Visit Recommended for this Activity (explain):	

Section 15 - Training

15.1 Purpose
This section describes the requirements for training personnel performing quality-related activities.

15.2 Scope
These requirements apply to all project personnel responsible for the performance of quality-related activities.

15.3 Policy
Personnel performing quality-related activities will be technically qualified for their task and familiar with the Quality Assurance Program Manual (QAPM) procedures.

15.4 Procedure
All TriMet, contractor and supplier personnel performing quality-related activities throughout the lifecycle of the project will be technically qualified for their task on the basis of appropriate education, training, certification and/or experience. Each person will also be familiar with the QAPM procedures or TriMet approved Quality Plan pertaining to their contract.

Some technical positions will require training and certification per industry or jurisdictional requirements. Such positions include specialized inspectors and NDT technicians. Training and certification for these positions will generally be the responsibility of the independent testing agency contracted to provide such services. Verification of these certifications will be performed by the contractor's Quality Manager or the TriMet QAM accordingly.

The consultant or contractor shall establish and maintain documented procedures for identifying training needs and provide for the training of personnel performing activities affecting quality. For the construction effort the training requirements and documentation should be directed at management positions, field engineers, project engineers and superintendents. Foremen and worker training should be documented during new hire orientation activities or at weekly Toolbox Talks.

A training matrix developed by the TriMet QAM listing the relevant staff positions within TriMet that require training in the quality procedures and documentation contained in this manual is included as an attachment at the end of this section. .

15.5 Responsibility
The consultant's, contractor's and supplier's project managers or quality managers are responsible for the training of their primary staff personnel that may perform activities affecting quality.

The TriMet QAM is responsible for ensuring that quality training for TriMet staff is adequate and complete.

15.6 Attachments

15-1 Quality Assurance Program Manual Training Matrix
15-2 Read and Acknowledge Form for Quality Assurance Program Manual Training

TRIMET

Quality Assurance Program Manual Training Matrix

	QAPM Procedure Number														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Executive Director	RA	RA	RA												RA
Project Director(s) (incl Systems)	RA	RA	RA												RA
Program Director(s)	RA	RA	RA												RA
Design Manager(s), Project Manager(s), Resident Engineer(s)	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA
Inspectors	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA
Quality Assurance Staff	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA

RA = Read and Acknowledge training (See Note 1)

Procedure Number and Title

1. Management Responsibility
2. Quality Assurance Program and Documentation
3. Design Control
4. Document Control
5. Purchasing, Equipment Procurement and Construction
6. Control of Materials, Product Identification and Traceability
7. Control of Special Processes
8. Inspection and Testing Procedures
9. Inspection, Measuring and Testing Equipment
10. Inspection and Test Status
11. Non-Conformance
12. Corrective Action
13. Quality Records
14. Quality Audits
15. Training

Note(s)

1. A 'Read and Acknowledge Form' (Attachment 15-2) shall be filled out and signed by each individual participating in training on the Capital Projects Division QAPM.

TRIMET

Read and Acknowledge Form
for
Quality Assurance Program Manual Training

The Quality Assurance Program Manual Training Matrix lists the positions within the Division that require training in quality procedures and documentation. The training is in the form of reading and becoming familiar with particular sections of the Capital Projects Division *Quality Assurance Program Manual*.

Please note and perform the appropriate training for your position shown on the training matrix.

Please proceed with the "Read and Acknowledge" training at your earliest convenience.

You may contact the QA Manager regarding any questions you have about the manual. When you have read and understand the assigned procedures in the *Quality Assurance Program Manual* **please circle the corresponding numbers listed below for the sections assigned to your position**, sign and complete the remainder of the form and return it to Holladay Street to the attention of the QA Manager.

Procedure Number

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

This is to acknowledge that I have read and understand the Capital Projects Division *Quality Assurance Program Manual* procedure numbers identified above for my position as outlined in the QAPM Training Matrix, Section 15.

Name (Print) _____

Signature _____

Position _____

Date _____

Quality Assurance Program Definitions

The following definitions are provided to assure a uniform understanding of terms as they apply to the Capital Projects Division Quality Assurance Program Manual (QAPM).

Acceptance Test – Functional tests performed on articles submitted for acceptance. Acceptance tests shall not have a detrimental effect in the operational life of the article, but shall assure that each production article is the equal of that which successfully passes the qualification tests.

Assembly – A combination of subassemblies or components, or both, fitted together to form a unit.

Audit – A documented activity performed in accordance with written procedures or checklists to verify, by examination and evaluation of objective evidence, that applicable elements of the Quality Program have been developed, documented and effectively implemented in accordance with specified requirements. An audit should not be confused with surveillance or inspection.

Certificate of Compliance – A written statement, signed by a qualified party, attesting that the items or services are in accordance with specified requirements and accompanied by additional information to substantiate the statement.

Certification – The action of determining, verifying and attesting, in writing, to the qualifications of personnel, processes, procedures, or items in accordance with applicable requirements.

Certified (Personnel) – An individual certified by a recognized standard or approved as having successfully completed requirements of the standard or procedure.

Certified Test Report – A written and signed document, approved by a qualified party, which contains sufficient data and information to verify the actual properties or items and the actual results of all required tests.

Change Control – The systematic evaluation, coordination and approval or disapproval of all changes to the established baseline configuration. It also includes the performances of those actions necessary to ensure that the actual configuration of a system completely matches its technical description in the approved engineering drawings, specifications and related documents.

Characteristic – Any property or attribute of an item, process or service that is distinct, describable, and measurable, as conforming or nonconforming to specified quality requirements. Quality characteristics are generally identified in specifications and drawings, which describe the item, process, or service.

Checks – The tests, measurements, verifications or controls placed on an activity by means of investigations, comparisons, or examinations, to determine satisfactory condition, accuracy, safety or performance.

Configuration Management – A management method of producing an end result, which comprises three elements: product identification, change control, and configuration accountability. Configuration management may be distributed throughout a number of organizational entities.

Conformance – An affirmative indication or judgment that an item has met the requirements of the relevant specifications, contract or regulation.

Consultant – A person who gives expert or professional advice. This term may be used to address a designer or a design agency contracted by TriMet.

Contractor – Any organization under contract for furnishing items or services, typically related to construction activities. It includes the terms architect, designer, engineer, construction manager, contractor, consultant, vendor, supplier, subcontractor, sub-consultant, and sub-tier levels of these where appropriate.

Contractor/Supplier Audits – Audits to evaluate the Contractor's/Supplier's program shall be performed at the source of manufacture. They shall encompass a review of the quality system, verification of its implementation, and an evaluation of the hardware for status, documentation, and configuration.

Controlled Document – A document that is intended for limited, specified and tracked distribution and which must be periodically reviewed and updated as required.

Corrective Action Request – A document issued to the senior management of a group whose activities are not meeting requirements. This is a significant document that, in effect, warns the designer, consultant, or contractor or others that continuing deficient activities will result in consideration of contract default.

Critical Design Review – A design review that takes place after prototype design and prior to release for production.

Defective Material – A material or component that has one or more characteristics that do not comply with specified requirements.

Deficiency – A minor deviation from the design or specification that does not affect form, fit or function of the item or system.

Design – Technical and management processes that create, fashion, execute, or construct documents according to a pre-determined plan or requirement.

Design Characteristics – There are three classifications of design characteristics as follows:

Critical – A characteristic of a specification, inspection, test or defect, which if not properly controlled, could result in a failure. Such a defect, is one that judgment and experience indicates is likely to result in hazardous or unsafe conditions for individuals using or depending upon the product or is one that judgment and experience indicates likely to prevent performance of the function of an end item.

Major – A characteristic of a specification, inspection, test or defect, other than critical – which if not properly controlled, could result in excessive costs, defect rates, rework, or delays in scheduled shipping dates. Such a defect, is likely to materially reduce the usability of the product or end item.

Minor – A characteristic of a specification, inspection, test or defect, other than critical or major, which if not controlled, does not materially reduce the usability of the product or end items for its intended purpose, or is a departure from established standards having

no significant bearing on the effective use or operation of the unit, or affects the appearance in a minor degree where appearance is a significant characteristic.

Design Input – Those criteria, parameters, basis or other design requirements upon which detailed final design is based.

Design Output – Documents such as drawings, specifications and other documents defining technical requirements of structures, systems and components.

Design Review – The formal review of an existing or proposed design for the purpose of detection and remedy of design deficiencies, which would affect fitness-for-use and environmental aspects of the product, process or service, and/or identification of potential improvements of performance, safety and economic aspects.

Designer – See Consultant or Contractor. Typically involved in preliminary engineering, final design and design/build phases of a project. Manages and performs advancement of design, to include drawing and specification updates.

Discrepant – Being at variance with established requirements.

Document – An original or official paper relied on as the basis, proof or support of something; a writing conveying information. Documents may include but are not limited to loose-leaf or bound books, drawings (tracings and/or reproductions), electronic mails, engineering calculations, procedures, specifications, standards, reports, manuals and other material generated that affects quality.

Documentation – Any written or pictorial information describing, defining, specifying, reporting or certifying activities, requirements, procedures or results.

Examination – An element of inspection consisting of investigation of materials, components, supplies or services to determine conformance to those specified requirements, which can be determined by such investigation. Examination is usually nondestructive and includes simple physical manipulation, gauging and measurement.

Final Design – Approved design output documents and approved changes therein.

Factory Tests – Tests performed at the point of manufacture prior to shipping. These functions/tests shall verify that items to be shipped comply with the specifications.

Finding – (as it relates to a quality audit) - A failure to comply with a requirement of a company's quality system. Issued at the completion of an audit to describe an item that is not in compliance with the approved procedure. Items assigned this status require that an Audit Finding Report (AFR) be issued and formally responded to by the entity audited.

Guidelines – Particular provisions, which are considered good practice, but which are not mandatory in programs intended to comply with the standard. The term "should" denotes a guideline; the term "shall" denotes a mandatory requirement.

Inspection – The process of measuring, examining, testing, gauging, observing or otherwise comparing an item with the application requirements.

Installation Verification Tests – Tests that verify equipment has been satisfactorily installed. Physical Inspection, circuit continuity, insulation resistance, and power-on tests shall be included as required.

Integrated Tests – Tests that are performed after completion of installation tests to demonstrate that System elements perform satisfactorily when connected to interfacing System elements or subsystems.

Item – Any level of unit assembly, including structure, system, process subsystem, subassembly component, part, or material.

Lot – A collection of units or product bearing identification and treated as a unique entity from which a sample is to be drawn and inspected to determine conformance with the acceptability criteria.

Maintainability – Ability of an item stated conditions of use to be retained in, or restored to, within a given period of time, a specified state in which it can perform its required functions when maintenance is performed under stated conditions and while using prescribed procedures and resources.

Material Tests – Tests performed to verify the basic strength of materials and/or fabrication and construction techniques, and includes tests of static, non-operating facilities.

Modification – A planned change in design or operation and accomplished in accordance with the requirements and limitations of applicable codes, standards, specifications, and predetermined safety restrictions.

Non-Conformance – A major deficiency in characteristic, documentation or procedure that may affect form, fit or function and renders the quality of an item unacceptable or indeterminate. Nonconformance items shall not be addressed with a Request For Information (RFI).

Objective Evidence – Any statement of fact, information, or record, either quantitative or qualitative, pertaining to the quality of an item or service based on observations, measurements, or tests, which can be verified.

Observation - (as it relates to a quality audit) – An item of evidence found during an audit that relates to the quality of the product, process, or quality system. Observations may or may not require remedial action.

Physical Segregation – The separation of items of questionable status from acceptable items in order to prevent their inadvertent use.

Preliminary Design Review – A design review, which takes place after conceptual design and prior to release for prototype or first article production.

Procedure – A document that specifies or describes how an activity is to be performed. It may include methods to be employed, equipment or materials to be used and sequence of operation.

Procurement Documents – Contractually binding documents that identify and define the requirements that items or services must meet in order to be considered acceptable by the purchaser.

Product Identification – The process of documenting assuring by appropriate marking and identification that a system and its components are traceable to baseline documentation.

Qualification (Personnel) – The abilities gained through training to recognized standards, as well as practical experience, that enable an individual to satisfactorily perform a required function.

Qualification Test – A test that demonstrates that the design complies with the specifications.

Qualified Procedure – A procedure that incorporates all applicable codes and standards, manufacturer's parameters, and engineering specifications and has been proven adequate for its intended purpose.

Quality – The features and characteristics of an item that determine its ability to satisfy given needs.

Quality Assurance (QA) – All those planned and systematic actions necessary to provide adequate confidence that an item is in conformance with established requirements and will satisfy given needs. The activity of providing the evidence needed to establish confidence that quality functions are being performed adequately. QA is a management tool.

Quality Audit – A systematic independent examination that verifies or evaluates compliance to the operational requirements of the quality program specification, or contract requirements of the product or service.

Quality Control (QC) – Those functions which provide a means to control and measure characteristics as related to established System design requirements. The techniques and activities which sustain quality of an item to satisfy given needs; also the use of such techniques and activities. QC is a production tool.

Quality Records Categorization – Permanent quality records which have significant value.

Recommendation – (as it relates to a quality audit) - Information provided as the result of an audit activity to inform the consultant, contractor, designer, etc. that while a reviewed item is not in violation of the approved procedure, it may be improved upon or brought closer in line to the procedure. A formal response is not required for a recommendation provided during an audit.

Remedial Action – Documented commitment of specific action planned or being implemented to resolve a known and identified condition, or conditions, adverse to Quality. Typically used in reference to a non-conforming condition or item.

Request For Information (RFI) – A document generated by a designer/contractor to the owner or design group to clarify a condition before work is performed. Shall not be used to address nonconforming work.

Safety Certification – A contractual systematic approach to identifying safety requirements, verifying safety features, and attesting to the overall safety of the system before placing a new or modified feature or segment into service, revenue or otherwise.

Source Surveillance – A review, observation, or inspection for the purpose of verifying that an action has been accomplished as specified at the location of material procurement or manufacture.

Specification – A detailed presentation of requirements that a product, material, service or process must meet.

Standard – Guidelines, benchmarks or examples established and approved by a recognized authority.

Storage – Holding items in an area other than their permanent location.

Subcontractor – See Contractor

Subsystem – A group of assemblies or components combined to perform a single function.

Surveillance – Monitoring or observation to verify whether an item or activity conforms to specified requirements. A QA activity, less formal than an audit, performed to observe and evaluate field or office quality oriented activities and processes. This activity may be documented in a memo or surveillance report form.

Technical Basis – Information that identifies the specific technology upon which the design criteria for materials, items processes, or calculation methods and analyses are based.

Testing – The determination or verification of the capability of an item to meet specified requirements by subjecting the item to set of physical, chemical, environmental or operating conditions.

Traceability:

(Distribution Sense) – The ability to trace the history, application or location of an item, and like items or activities, by means of recorded identification.
(Calibration Sense) – The ability to trace the calibration of measuring equipment to a national standard, a recognized primary standard, or basic physical constants or properties, usually through a series of calibrations of intermediate level standards.
(Data Sense) – The ability to trace the operational, computational and recording steps of measurement or evaluation of an item, process or service.

Vendor – See Contractor

TRIMET

Quality Assurance and Quality Control Responsibility Matrix (per the Capital Projects QAPM)

Section	Activity Description	Responsibility										
		Designer	Consultant	Contractor/Supplier	CAD Manager	Configuration Mgmnt	Design/Project Mgr	Design Lead/Support	RE/Staff	Project Director	Program Director	QA Mgr/Staff
1	Development, establishment, implementation and evaluation of the QAPM											X
2	Day-to-day management of QAPM requirements						X		X			
2	Administration and Implementation of the QAPM											X
2	Review all proposals prior to issuance and determine quality program requirements											X
2	Review and comment on the contractor's proposed Quality Plan								X			X
2	Verifying the effectiveness of the QAPM											X
2,3,5	Develop, implement, document and maintain a Quality Plan for their work	X	X	X								
3	Overall coordination of design effort						X					
3	Coordination with Design Lead for electronic document management effort				X							
3	Coordination of all items related to their assigned specialty							X				
3	Oversight of design as it relates to cost/schedule (coordinate with Proj Dir)					X						
3	Audit the design process to verify that the Quality Plan has been implemented	X	X									X
3	Examine the consultants quality documentation to verify that the quality record is complete											X
3	Performing design reviews in accordance with the PMP	X	X									
3	Completeness and accuracy of TriMet's design reviews									X		
3	QA activities and quality issue disposition for design activities											X
4	Development and implementation of the document control system										X	
4	Organization and control of internal files and for providing required documents to TriMet for inclusion in the document control system	X	X	X								
4	TriMet electronic document management system	X	X		X							
4	QA verification of the document and drawing control systems											X
5,6	Determination of the required quality requirements and standards for the work included in the material, equipment or construction contract	X	X				X	X	X	X		
5	Verification and oversight of the contractor's day-to-day quality activities								X			
5	Verification of suitability and sufficiency of the quality requirements included in the bid package											X
5	Evaluation of the quality capabilities of the contractor proposed for award											X
5	Review and disposition of the contractors proposed Quality Plan								X			X
5,6	Quality Assurance audits during the term of the contract											X
6	Inclusion of materials control procedures in its Quality Plan			X								
6	Verification of materials upon delivery			X					X			

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Quality Assurance and Quality Control Responsibility Matrix (per the Capital Projects QAPM)

Section	Activity Description	Responsibility										
		Designer	Consultant	Contractor/Supplier	CAD Manager	Configuration Mgmnt	Design/Project Mgr	Design Lead/Support	RE/Staff	Project Director	Program Director	QA Mgr/Staff
7	Inclusion of special processes control procedures in its Quality Plan			X								
7	Verification of the adequacy of the proposed control procedures and audits of the special processes during the term of the contract											X
8	Determining the required inspections and tests and including these requirements in the contract requirements	X	X				X	X				
8	Inclusion of inspection and test procedures in its Quality Plan and implementation accordingly			X								
8	Verification of inspections and test results and collection of documentation								X			
9	Inclusion of test equipment control procedures in Quality Plan and implementation of the requirements accordingly			X								
9	Verification of proper calibration and collection of data								X			
10	Inclusion of test/inspection status procedures in its Quality Plan and implementation of the procedures accordingly			X								
10	Verification of test/inspection status								X			
11	Initiate an NCR	X	X	X			X		X			X
11	Provide support for NCR evaluation as requested by the RE	X	X									X
11	Implementing the disposition of non-conforming items per the requirements of the NCR and documenting the disposition and conclusion			X								
11	Initiating and coordinating review and disposition of NCRs. Tracking and close-out of NCRs								X			
11	Review of all NCRs											X
12	Tracking issued CARs and concurring in effective implementation								X			X
12	Implementing corrective actions and incorporation into the Quality Plan			X								
12	Concurring on corrective actions											X
13	Establishing and maintaining quality records	X	X	X	X		X	X	X	X	X	X
13	Assembling, preparing and maintaining all quality records for archiving								X			
13	Perform audits of quality records											X
14	Perform audits of sub-designers/contractors/suppliers and internal audits	X	X	X								
14	Performing or having performed quality assurance audits											X
15	Training of staff affecting quality (management, engineers, superintendents)	X	X	X								
15	Ensuring that training for TriMet staff is adequate and complete											X

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Quality Assurance Program Manual
Attachment Summary

Section	Attachment Number	Description
1	1-1	Capital Projects Division Construction Project Organization Chart
3	3-1	Design Document Management Procedure and Flowchart
3	3-2	Document Review Comment Form
3	3-3	Design Document Review Stamp
5	5-1	Quality Assurance System Evaluation
5	5-2	Essential Elements of a Quality Program - Evaluation Summary
11	11-1	Non-Conformance Report (NCR) with Instructions
11	11-2	Non-Conformance Report Log
12	12-1	Corrective Action Request (CAR) with Instructions
12	12-2	Corrective Action Request Log
14	14-1	Quality Assurance Audit Schedule
14	14-2	Design Activity Audit Checklist
14	14-3	Construction Activity Audit Checklist
14	14-4	Resident Engineer Records Assessment Checklist
14	14-5	Audit Finding Report (AFR) with Instructions
14	14-6	Quality Assurance Audit Log
14	14-7	Quality Assurance Surveillance Report
15	15-1	Quality Assurance Program Manual Training Matrix
15	15-2	Read and Acknowledge Form for Quality Assurance Program Manual Training
Appendix	A	Quality Assurance Program Definitions
Appendix	B	Quality Assurance and Quality Control Responsibility Matrix
Appendix	C	Quality Assurance Program Manual Attachment Summary