Massachusetts Bay Transportation Authority

Capital Delivery

Quality Assurance Plan

Revision 3, *September* 2019

Revision Table

Revision	*Date*	*Editor*	*Details*
1	February 2005		
2	September 2009		
3	September 2019	F. Colmenares/ P. Hagerty	Changed format and structure to clearly establish responsibilities, requirements and procedures. This revision also include changes based on PMOC review.

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Mission Statement

The Massachusetts Bay Transportation Authority is committed to the implementation of a Quality Assurance Plan that meets the requirements of the U.S. Department of Transportation Federal Transit Administration Quality Management System Guidelines, FTA-PA-27-5194-12.1. This plan is applied to every transit system project and all capital contract work from development through project completion. The plan ensures compliance with all requisite contract documents, codes and standards during the design, construction and acceptance of the project. It ensures that completion of the consultants' and contractors' work is verified and documented in accordance with a Quality Assurance Plan and that the contracts lead to safe, on-time and cost effective transit service.

Following the plan will allow for early detection and correction of potential problems, minimize costs and prevent delays. It will also set standards for acceptance of deliverables. The plan includes a uniform system of documentation that allows easy access for audit and evaluation of adherence to the plan for specific project(s).

The plan is integral to the MBTA commitment to improve efficiency, quality, and service. The plan is critical to the development of a management environment that produces excellence and accountability.

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OCTOBER 15, 2019
Date

Definitions

Quality Audit: A systematic, independent process of gathering objective evidence to determine whether audit criteria are being met. Audits are based on a sample and are independent of the system, process or product being audited, unlike verification activities, which are part of a process.

Quality Management System: The American Society for Quality (ASQ) defines the QMS as "A formalized system that documents the structure, responsibilities and procedures required to achieve effective quality management."

Quality Procedures: Written instructions for implementing various components of the QMS. Procedures should identify what is to be done; who should do it; and how, where, and when it should be done.

Quality Plan: The typical form of the main document used in developing and implementing a QMS. The Quality Plan should contain the Quality Policy, objectives, and written procedures. In larger properties, there can be more than one Quality Plan. For example, there could be a corporate quality plan, divisional quality plans, and specialized quality plans for design, procurement, construction, operations, and maintenance activities, with each prepared by those responsible for the work.

Quality Control: Techniques that are used to assure that a product or service meets requirements and that the work meets the product or service goals. Generally, QC refers to the act of taking measurements, testing, and inspecting a process or product to assure that it meets specification. It also includes actions by those performing the work to control the quality of the work. Products may be design drawings/calculations or specifications, manufactured equipment, or constructed items. QC also refers to the process of witnessing or attesting to, and documenting such actions.

Quality Assurance: QA is all those planned and systematic actions necessary to provide adequate confidence that a product, structure, or system will perform satisfactorily in service. Quality Assurance includes Quality Control, which comprises those quality assurance actions related to the physical characteristics of a material, structure, component, or system that provide a means to control the quality of the material, structure, component, or system to meet its predetermined requirements.

Quality Oversight: Watchful care or general supervision of the activities affecting Quality. Quality oversight verifies and validates the execution of the Quality Management System.

Quality Surveillance: The continual monitoring of a process; a type of periodic assessment or audit conducted to determine whether a process continues to perform to a predetermined standard.

1. MANAGEMENT RESPONSIBILITY

1.1. Purpose

The purpose of this chapter is to establish the Massachusetts Bay Transportation Authority Capital Delivery (herein after CD) management responsibilities to ensure first time quality in all projects managed by this organization.

1.2. Scope

The requirements in the chapters of this QAP (Quality Assurance Plan) apply to CD, consultants and contractors who perform work that affects the quality of CD projects.

1.3. Policy

It is the policy of the MBTA (Massachusetts Bay Transportation Authority) that projects falling within the responsibility of CD shall be planned, designed and constructed with the highest regard for quality.

1.4. Requirements

1.4.1. Contractors hired by CD shall develop, establish and document a QAP tailored to their scope of work and that complies with the CD Standard Specifications Section 01400. This QAP shall be submitted for approval to the QA/QC (Quality Assurance/Quality Control) organization in CD.

1.4.2. Consultants QAP shall be submitted for approval to CD and follow the requirements established in this QAP.

1.4.3. The responsibilities of personnel who affect and oversee quality shall be identified and their interrelationships with project management defined. These relationships are best established in an organization chart.

1.4.4. The QA/QC organization shall regularly perform internal and external audits to verify compliance with this QAP. These audits shall be performed in accordance with the requirements establish in Chapter 14 – Audits – of this QAP.

1.4.5. The QA/QC organization shall have the support from upper management, should be documented in the policy to meet the project objectives and be driven by the Mission Statement.

1.4.6. A revision frequency of five years the QAP has been established and documented to ensure its continuing suitability, adequacy and effectiveness.

1.4.7. When quality activities responsibilities such as; monitoring, oversight and improvement of processes are delegated to other organizations, a memo shall be signed and documented as an agreement following the requirements established in Chapter 4 - Document Control - and Chapter 13 - Quality Records - of this QAP.

1.4.8. The MBTA CD senior management will perform an annual review of the CD QA Program to evaluate its effectiveness.

1.5. Responsibilities

1.5.1. The MBTA Capital delivery organizational chart (Figure 1) shows the reporting relationships of CD staff members.

1.5.2. The QA/QC organizational chart (Figure 2) shows the reporting relationship for staff members in charge of implementing, verifying and administering this QAP and its related activities.

1.5.3. The *Assistant General Manager* (AGM) for CD has the ultimate responsibility for establishment and execution of this QAP. The AGM has the final decision on quality conflicts brought to his attention by specific Project Management Staff.

1.5.4. *Director of Contract Administration* administers the Authority's solicitation, award and administration of architect-engineer and CD construction contracts.

1.5.5. *Director of Design* oversees the Authority's design standards and manages design quality review.

1.5.6. *Director of Document Control* is responsible for managing department records, plans and documents.

1.5.7. *Project Managers* (PM) are responsible to oversee the execution of the design or construction contracts in accordance with the MBTA policies and procedures. Additionally, they coordinate with various MBTA departments and external regulatory agencies, as appropriate; to bring the project to completion. Responsible for monitoring GC's adherence to schedule. PMs supervise Resident Engineers and Inspectors.

1.5.8. *Resident Engineers* (RE) oversees the day to day construction work, oversees the inspection of processes and facilitates communication between the MBTA and construction contractors. REs supervise Inspectors.

1.5.9. *Inspectors* are responsible for providing oversight of contractors QC activities in accordance with conformed specifications and plans.

1.5.10. *Director of QA/QC* is responsible to ensure that the CD quality policy is implemented and maintained on projects. Additional responsibilities include:

a. Implementing this QAP and ensuring that consultants and contractors submit the appropriate QAP to CD for review and approval.

b. Coordinate with Senior Management to conduct annual reviews (e.g. audits, self assessments, surveillances) of the QAP and quality policy to ensure that the program remains suitable and effective.

c. Identifying quality problems and providing recommendations to project management to develop corrective actions.

d. Validate if corrective actions developed are preventing recurrence of problems identified.

e. Review Non Conformance Reports (NCR) to ensure proposed resolution and preventative action are appropriate and proportional for correcting the items addressed in the NCR

1.5.11. Quality Control Engineers/Inspectors

a. Review quality plans submitted by contractors and suppliers for conformance with specifications, this QAP and appropriate standards

b. Perform and document field inspections to verify the approve quality plans are implemented.

c. Review materials and procedures for conformance with specifications

d. Support CD staff in accessing the implementation of quality inspection/testing

1.5.12. Material Testing Engineer/Material testers perform review and testing in accordance with approved Capital Delivery Quality System Manual.

1.5.13. Process Owners role is to be the subject matter expert of the activities they controlled, and are responsible for providing oversight and maintenance of their processes as required by the applicable elements of the CD QAP.

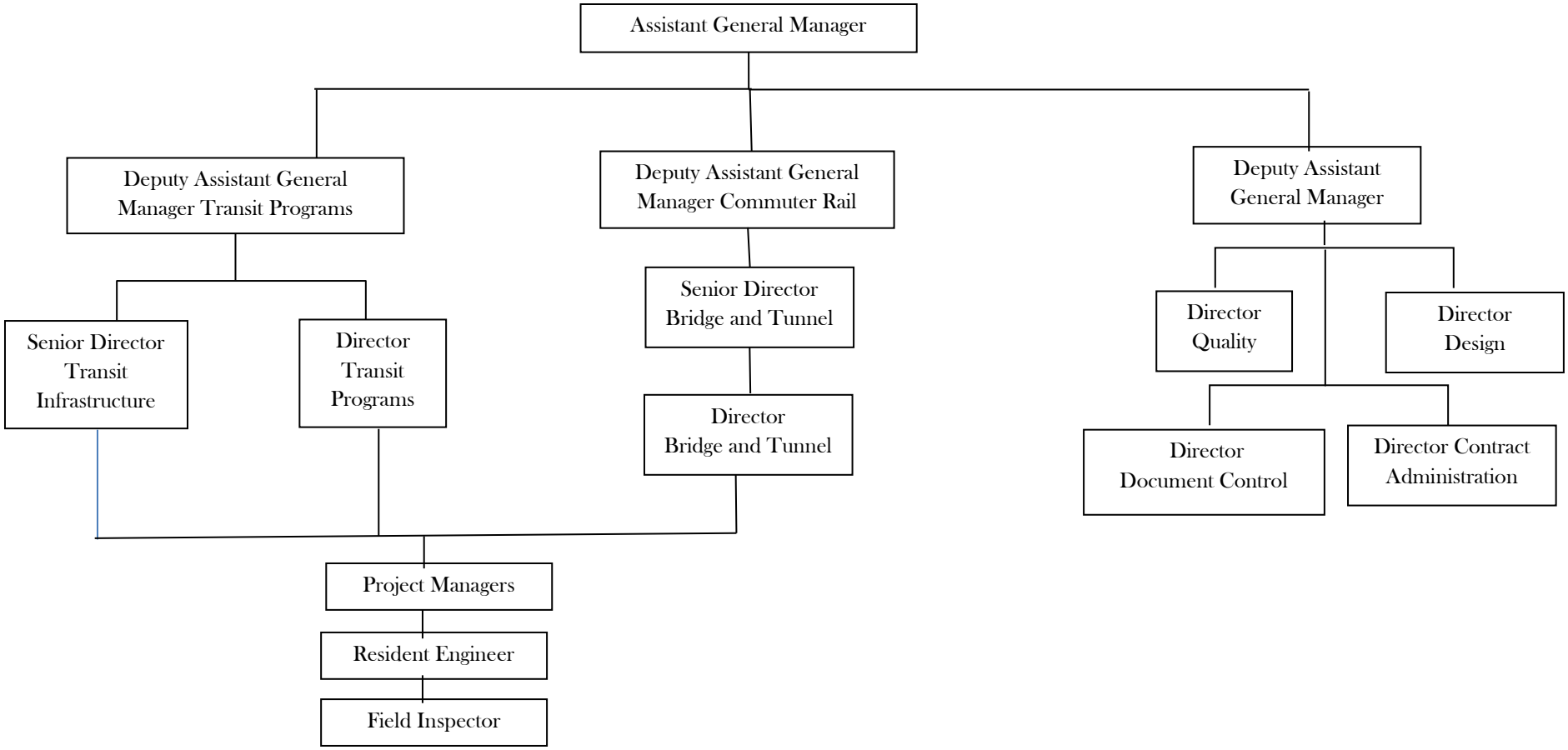


Figure 1: MBTA Capital Delivery Organizational Chart

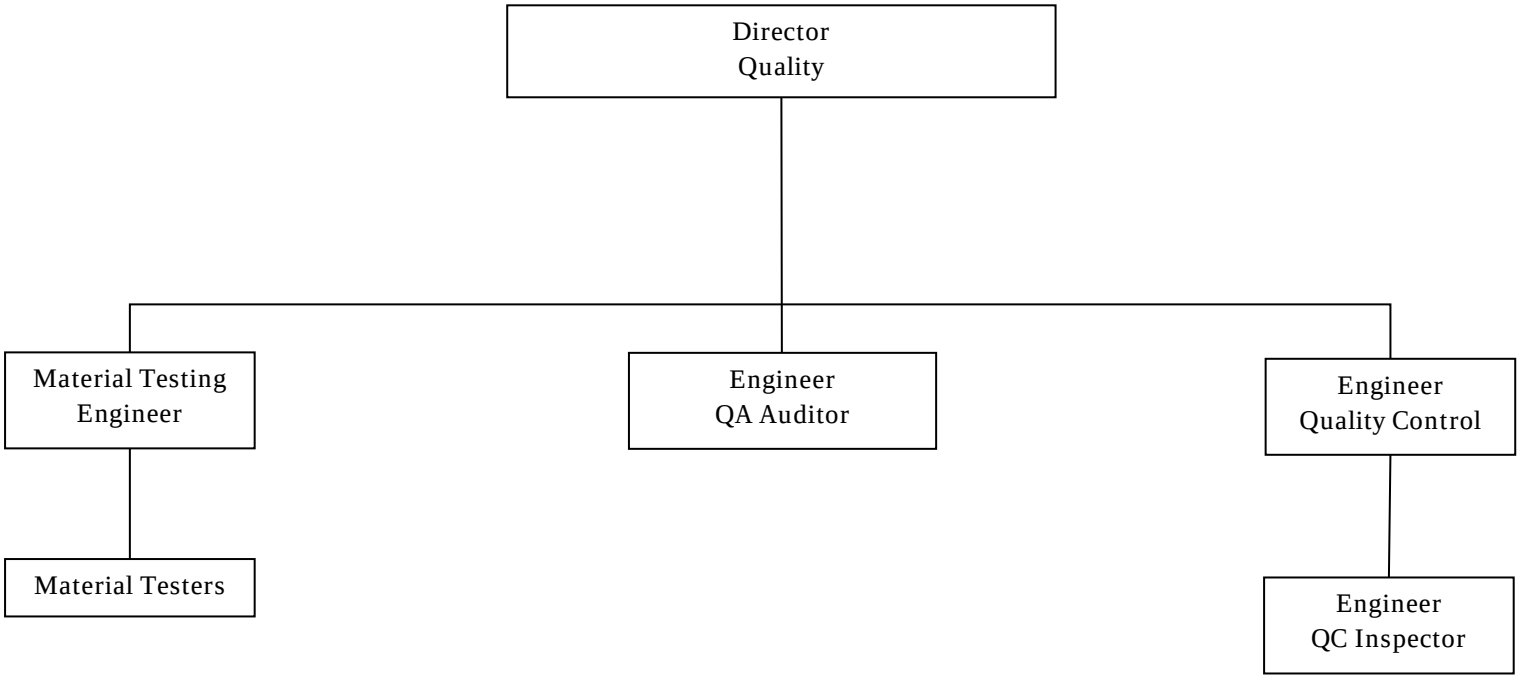


Figure 2: MBTA Capital delivery QA/QC Organizational Chart

2. DOCUMENTED QUALITY MANAGEMENT SYSTEM

2.1. Purpose

The purpose of this chapter is to identify the QMS (Quality Management System) for CD that will ensure project quality objectives are satisfied. To accomplish that objective, this chapter establishes the scope, requirements, responsibilities and procedure to maintain and document the processes that encompasses this QMS.

2.2. Scope

The CD QMS apply to this department and extends to the consultants and contractors whose work could impact the quality of MBTA services and infrastructure.

2.3. Policy

Capital delivery QMS ensure all requirements of the FTA QMS Guidelines and the MBTA Configuration Management and Control Safety Program Manual are controlled by establishing procedures and processes intended to meet quality objectives. This is accomplished by monitoring QA/QC activities, identifying and trending instances of noncompliance based on number of NCRs issued, identifying and removing non-value or inconsistence steps in processes and by using this data to improve quality practices.

2.4. Requirements

2.4.1. A QMS shall be defined and documented by CD, consultants and contractors. The QMS shall address all the elements documented in this QAP. Deviations to requirements of the QAP shall be documented in the form of a memo, submitted to and approve by the QA/QC Director.

2.4.2. QMS process and procedure documents shall be controlled as established by Chapter 4 – Document Control – of this QAP. Additional procedures should be developed to compliment or expand on a specific element.

2.4.3. Management will lead and sponsor, as appropriate; the initiatives to implement and drive a QMS culture which includes; design quality, errors and omissions prevention, strategic quality planning, continual improvement, training and development.

2.4.4. The QMS shall strive for improvement of its processes and the people who execute them.

2.4.5. The manuals, procedures and instructions that encompassed the QMS documentation shall be reviewed frequently not to exceed more than 5 years per document.

2.5. Responsibilities

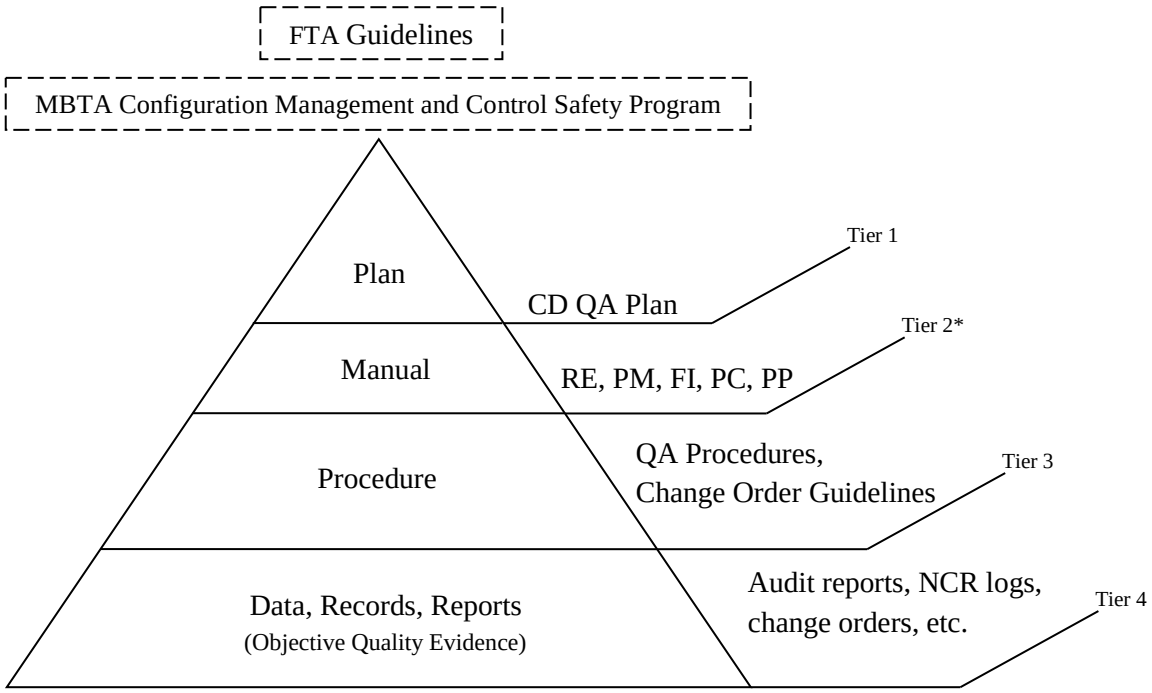
2.5.1. CD supporting processes controlled by organizations other than Quality shall identify a Process Owner and follow the roles, responsibilities established in Section 1, as well as the applicable elements of this QAP. For example; manuals, procedures, and instructions owned by supporting groups must meet, but it is not limited to requirements such as Document Control, and Records Control.

2.5.2. Capital delivery QA/QC personnel are responsible to maintain and improve their QMS.

2.5.3. Capital delivery personnel should be trained in the QMS per the requirements established in Chapter 15 of this QAP.

2.6. Procedure

The requirements to control quality activities at CD rolls down from the FTA QMS Guidelines and the MBTA Configuration Management and Control Safety Program Manual. At CD these requirements are then established at a higher tier (1st) by this QAP and the details to comply with them are established in processes at the 2nd tier by manuals such as the Project Manager manual and Project Controls manual. Specific procedures, records and data are then roll to the next tiers (2nd, 3rd and 4th). Figure 3 shows the QMS structure for CD.



**Tier 2*
RE – Resident Engineer
PM – Project Manager
FI – Field Inspector
PC – Project Controls
PP – Project Procurement

Figure 3: MBTA Capital delivery QMS Structure

3. DESIGN CONTROL

3.1. Purpose

The purpose of this chapter is to establish the requirements for review and verification of design activities by and for CD.

3.2. Scope

Design Control processes and procedures apply to CD and extend to consultants and contractors who participate in design activities during any phase of a CD project. The consultant and contractors will manage efforts in the conduct of their design work and have the ultimate responsibility for design control from development to completion.

3.3. Policy

Design control ensures that the design requirements are understood, planned and scheduled. Design interfaces and design verification activities, executing the design verification activities, and controlling design changes are planned through project completion. CD's objective is to establish the processes and procedures to accomplish a design that meets and exceeds standards without compromising the quality of the final product.

3.4. Requirements

3.4.1. A Design Control system shall be defined and documented. Part of this system includes controls for meeting the design phases established by the PM Manual and Design Guidelines. These controls include but are not limited to; code reviews, system safety certification, design reviews, constructability reviews, peer reviews and the independent review of drawings, calculations, design changes and verification against specifications. This system will include a process and procedure to assure design documents are reviews at appropriate intervals and their status is maintained throughout the design development process.

3.4.2. The designer QAP shall identify who has responsibility for each phase of design verification activities.

3.4.3. Designs will be based upon MBTA design criteria and standards, incorporate code requirements and criteria to safeguard functional operations as detailed in the scope of work contained in the Contract Documents.

3.4.4. The MBTA will provide designers, as appropriate, with MBTA design input requirements.

3.4.5. MBTA design criteria shall be developed and documented through design standards, guidelines and directives.

3.4.6. MBTA shall review, as appropriate; design output documents and deliverables received from the designers.

a. Comments from MBTA must be documented, dispositioned and recorded in the final specifications and drawings delivered.

b. Comments resolution between the MBTA and Engineer shall be tracked using the submittal process of Capital Delivery.

3.4.7. If there is a compelling reason to deviate from the design input documents or to skip a design phase, the Director of Design and Architecture and QA/QC shall document and approve any deviation.

a. During project design, the reason for the deviation shall be requested by memo to the Director of Design and Architecture, and QA/QC. The Design Process Deviation memo shall include justification by all parties involved. Typically, for process deviations, the requestor is someone from the Project Management Team of the Capital Delivery Department. If the Designer requests the deviation, the justification shall be accepted by the Capital Delivery Management Team before being submitted to the Director of Design and Architecture, and QA/QC.

b. During construction, Design Changes can be requested by anyone in the Capital Delivery Project Management Team, or by the General Contractor using the Design Change Request (DCRs) form in the contract specifications. Typically, DCRs are accepted by the Engineer of Record (EoR) and approved by the QA/QC Department. Processed DCRs are incorporated into the field plan set used by the General Contractors, and documented in the as-built drawings delivered to the MBTA.

3.5. Responsibilities

3.5.1. QA/QC personnel from CD are responsible to review designers QAPs for compliance to the Design Control requirements in this plan and the FTA QMS Guidelines.

3.5.2. CD is responsible to provide independent reviews and to document all comments in a standardize format that meets the requirements of Chapter 4 – Document Control – of this QAP. Records generated during this process are considered

quality records and therefore; they shall be controlled as established in Chapter 13 – Quality Records – of this QAP.

3.5.3. Design consultants are responsible to provide conformed “for-construction” drawings for the project as part of their documentation.

3.5.4. General contractors are responsible to prepare as-built drawings for the project close-out as part of their documentation.

3.6. Procedure

Details of the processes and procedures required to comply with the requirements of Design Control established above can be found in the PM and PC Manuals of CD.

4. DOCUMENT CONTROL

4.1. Purpose

This chapter establishes the requirements to ensure documents are properly reviewed, and controlled before being distributed or available to their users.

4.2. Scope

This chapter applies to CD QMS and extends to project specific documents develop by consultants and contractors.

4.3. Policy

MBTA Capital delivery Document Control ensures everyone is working to the current revision of a document, and that obsolete documents are properly controlled.

4.4. Requirements

4.4.1. A Document Control system shall be defined and documented. This system should include controls for all tiers of the CD QMS established in Chapter 2 – Documented Quality Management System –. The CD QAP 5.1 provides details for the Document Control of Design and Construction projects.

4.4.2. The Document Control system shall establish the documents to be controlled, and include processes to maintain revision control and prevent inadvertent use of obsolete documents.

4.4.3. Changes to processes and procedures of the QMS shall be reviewed and the comments accepted or rejected by the lead or group who controls it. This review (comments and changes) should be documented and accessible for future reference.

4.4.4. Documents developed for the control of processes should strive for consistency in their format so as to reduce variance throughout the QMS. QAP 3.2 provides details about the format used for developing Quality Procedures.

4.4.5. To maintain revision control and reduce unintended changes to a document, the original file shall be kept in a location accessible only to the lead or group in charge of the document.

4.4.6. After review and approval, these documents shall be available in a common area and in a format to protect against changes.

4.4.7. Obsolete documents (electronic and physical) shall be identified and archived as established in Chapter 13 – Quality Records – of this QAP.

4.4.8. Records generated during this process are considered quality records; therefore, they shall be controlled as established in Chapter 13 of this document.

4.5. Responsibilities

4.5.1. The Process Owner established in Section 2.5.1 is responsible for the review, approval and distribution of updated documents related to Capital Delivery internal processes.

4.5.2. Consultants and contractors are responsible for submitting revisions of new documents, and for removing or marking previous revisions as obsolete. The documents include but are not limited to, Quality Plans, Specifications, Drawings, As-builts, and memos.

4.6. Procedure

4.6.1. Proposed changes to processes manuals, procedures and instructions shall be sent to the Process Owner as a memo. These changes should be documented and tracked using a revision control log.

4.6.2. The Process Owner reviews the proposed changes for document consistency and to avoid conflicts with other documents. These changes should be discussed with appropriate stakeholders, and if a new revision is granted, the document shall be distributed promptly. If proposed changes are accepted but do not grant a new revision, they shall be tracked for inclusion in the next major revision.

5. PURCHASING

5.1. Purpose

This chapter establishes the requirements for the purchasing of products and procurement of services that affect the quality of projects, by considering the appropriate quality elements to be included in the contract.

5.2. Scope

The Policy and requirements for Procurement and Purchasing applies to CD and extends to consultants, contractors and suppliers.

5.3. Policy

MBTA Capital Delivery policy is to ensure that the procured service and purchasing of products conforms to the specified requirements established in the contract, QMS and this QAP.

5.4. Requirements

5.4.1. The Purchasing process as managed by the MBTA Materials Department and the Contract Administration Department shall follow their requirements for purchasing materials or services.

5.4.2. The procurement of Professional and Construction services is managed by the CD Contract Administration Department. They are responsible to review consultants, and general contractor's ability to meet the requirements established in the bid documents. The CD procurement process is controlled by the Procurement Manual, which is encompassed by the CD QMS and is required to meet the quality requirements in this plan.

5.4.3. The procurement documents should be reviewed and approved by an independent and qualified authority for adequacy and consistency of specified requirements.

5.4.4. Contracts shall specify the right of MBTA to carry out or delegate reviews, audits, inspection and tests for the verification of products and services against contract documents. These documents include but are not limited to, specifications, drawings, test and inspection reports, quality plans, Request for Information, Design Change Requests, and Non-conformance reports. Inspection

and testing processes used during verification shall meet the requirements established in Chapter 8 – Inspection and Testing – of this QAP.

5.4.5. The quality program to be specified in contracts are commensurate to the complexity level of the project. As appropriate, the quality elements established in this QAP shall be addressed by the consultants, and general contractors.

5.4.6. Procurement requirements must include that general contractor's selects sub-contractors, and suppliers based on their qualifications to meet the quality elements of this plan.

5.4.7. Deviations to contract requirements shall be documented and approved in writing by an authorized representative of CD.

5.4.8. Procurement policies shall comply with the current Federal Transit Administration Circular 4220 Third Party Contracting requirements.

5.4.9. The contract or purchase documents shall clearly specify the expectations of the purchaser, including relevant standards, drawings, specifications, process requirements, and inspection instructions.

5.5. Responsibilities

At CD the Contract Administration organization performs the following activities for Professional Service Contracts and Construction Contracts:

5.5.1. Manages the advertisement, selection, award and contract execution of contracts for consultants to provide professional services.

5.5.2. Assists with the scope and fee negotiations with consultants.

5.5.3. Manages the advertisement, bidding and contract award of construction contracts.

5.5.4. Manages the constructor prequalification process.

5.5.5. Reviews consultant contract amendments, task orders, and construction change orders.

5.5.6. Assists with processing consultant and contractor payments.

5.5.7. Manages FTA, State and outside audits.

5.5.8. Evaluates consultant and contractor performance through performance reviews.

At CD the Materials Management organization performs the following activities during procurement of a project:

5.5.9. Procures materials and services for CD projects when requested.

5.5.10. Recommends award of materials and services contracts.

5.6. Procedure

Details regarding the processes and procedures needed to comply with the requirements of Procurement established above can be found in the Procurement Manual.

6. PRODUCT IDENTIFICATION AND TRACEABILITY

6.1. Purpose

This chapter establishes the requirements to prevent the use of incorrect items and to ensure that only correct and acceptable items are used and installed. Traceability means that items are traceable to a particular project, specific warranty, test report, supplier, point in time, purchase order, or through production.

6.2. Scope

The requirements for Product Identification and Traceability apply to CD and extend to consultants, contractors and suppliers.

6.3. Policy

The objective of the requirements established in this chapter is to ensure that the materials, products, equipment and parts used in the construction and improvement of MBTA infrastructure can be identified and traced to the correct and acceptable standards.

6.4. Requirements

6.4.1. A product Identification and Traceability process shall be defined and documented by the General Contractors, sub-consultants and suppliers to ensure that only correct and acceptable items are used or installed.

6.4.2. Materials requiring traceability to its origins for purpose of laboratory analysis shall be uniquely identified, and tracked to assure that acceptable materials are installed in the appropriate end use. These items will be traceable to heat, lot, batch, laboratory analysis or other industry standard method of identification.

6.4.3. Physical identification and control shall be used as required by the specifications and drawings including bar codes, model or serial numbers.

6.4.4. For items where physical identification is not stated or is impractical, a physical separation, procedural control, or other appropriate means shall be employed.

6.4.5. Items that fail to possess identification, items for which record traceability has been lost, or items that do not conform to requirements shall be segregated, identified by other means and documented as a nonconformance per the requirements of Chapter 11 – *Nonconformance* – of this QAP.

6.4.6. Records generated during this process are considered quality records; therefore, they shall be controlled as established in Chapter 13 – Quality Records – of this document.

6.5. Responsibilities

6.5.1. General contractors, sub-contractors and suppliers are responsible for inspecting, documenting, and archiving the records confirming materials meet contract requirements. All documentation shall include the unique identifier used to track those items. All quality records will be transmitted to MBTA in accordance with the contract requirements.

6.5.2. The MBTA is responsible for checking that the materials used meet contract requirements. This includes visiting sites and suppliers to ensure proper quality practices are in place for the identification and traceability of materials.

7. PROCESS CONTROL

7.1. Purpose

The purpose of this chapter is to identify requirements used to control the quality of special processes, the results of which cannot be verified by subsequent inspection and testing of the product; and to identify those responsibilities to maintain and document these processes.

7.2. Scope

The requirements for Process Control apply to CD and extend to consultants, contractors and suppliers who need to identify, develop and follow special processes. These requirements apply to work including but not limited to, steel fabrication, coating, ground modification, foundation construction, track welding, life safety/security system fabrication/installation and any other items identified by specification, code or authority having jurisdiction.

7.3. Policy

The policy of MBTA is to ensure that special processes that directly affect quality are identified and performed under controlled conditions. To achieve this, the QA/QC organization performs inspections and audits of these processes as applicable.

7.4. Requirement

7.4.1. Designer shall identify through specification requirements or reference to industry standard those items which require process control

7.4.2. Contractors, fabricators and suppliers shall include procedures for the control of special processes in their quality program. These procedures shall reference and conform to industry standards, codes and specified quality plans.

7.4.3. Continuous monitoring may be required when results of a final inspection cannot verify acceptance, or if work was completed in an improper sequence.

7.4.4. Procedures, project documents and its records shall conform to the requirements established in Chapter 4 and 13 (Document Control and Quality Records, respectively) of this QAP.

7.4.5. Activities that do not meet the intent of the requirements established in special processes procedures and specifications shall be documented as non-

conformances and follow the requirements of Chapter 11 – *Nonconformance* – of this QAP.

7.5. Responsibilities

7.5.1. The end user or designer shall establish and document specific requirements for the items purchased or constructed.

7.5.2. Contractors, fabricators and suppliers are responsible for developing, preforming and documenting special processes and inspections in accordance with the contract documents and referenced codes.

7.5.3. QA/QC personnel from CD are responsible to review QAPs for compliance with the plans and specifications. .

8. INSPECTION AND TESTING

8.1. Purpose

This chapter establishes the requirements to control and verify quality by performing inspection and testing by the specified inspection/testing agency.

8.2. Scope

The requirements in this chapter apply to materials and products incorporated into the work. The requirements for inspection and testing established herein cover the process and procedures for verifying materials or products from receiving, in-process to final inspection, testing and reporting.

8.3. Requirements

8.3.1. The MBTA or consultant will review the QC portion of the MBTA basis specifications. Those portions of the specifications will be modified, as applicable, to correspond with the size and complexity of the project.

8.3.2. The contactor, supplier, or fabricator will establish Inspection and Testing procedures commensurate with the contract specification requirements of the project. The procedures shall be captured in the Project specific Quality Plan and must reference the governing codes or industry standards applicable to control the quality of the work being performed.

8.3.3. The Quality Plan shall include requirements to control receiving, in-process and final inspection/testing of material or product. Unless otherwise specified, the plan will elaborate on the frequency and activities required to ensure conformance of the finished product to the specifications.

8.3.4. Related activities that need to be controlled by the Project specific Quality Plan include:

a. Records of the various inspections and tests proving that the product or material has passed inspection or test shall conform to the requirements of Chapter 13 – *Quality Records* – of this QAP.

b. Product or materials that fail to meet the specified requirements shall be controlled in accordance with the requirements of Chapter 11 – *Nonconformances* – of this QAP.

c. Equipment used during inspection or testing shall conform to the requirements established in Chapter 9 – Inspection, Measurement and Test Equipment – of this QAP.

8.3.5. The testing and inspection activities performed shall be specified or referenced in the project documents, and conducted in accordance with the governing codes, standards and jurisdictions (ASTM, ASME, ASCII, etc.) applicable to the material or product.

8.3.6. Inspection and testing activities shall be performed in accordance with the safety standards applicable to these activities. Safety shall complement the procedures to perform test and inspection while keeping the quality integrity of the product, material and its records.

8.4. Responsibilities

8.4.1. Contractor, supplier, and/or fabricator personnel performing inspections and tests shall be properly trained and maintain applicable certifications. They shall be independent of those having direct responsibility for the construction or installation of the items being inspected or tested.

8.4.2. MBTA field staff (REs, field inspectors) verify contractor QC personnel are performing required testing/inspection. This verification is documented by co-signing standard QC reports.

8.4.3. MBTA QC staff will perform audits of the GC, supplier or fabricator's Testing or Inspection program following procedures outlined in Section 14 – Audits to confirm they are following approved quality plan.

8.4.4. The MBTA Material Testing lab performs independent assurance sampling and testing of common, bulk construction materials. Results of MBTA Laboratory testing is compared to GC's independent laboratory testing to confirm results are within industry standard range of deviation.

8.4.5. The GC/fabricator/supplier is responsible for establishing a frequency of testing/inspection to verify their work meets project specifications and applicable codes. Frequency shall not be less than minimums established by specifications or referenced codes. .

8.5. Procedure

The specific procedures for Inspection and Testing are captured in the contractor/supplier's approved Quality Plan or in the MBTA QC Materials Testing

Laboratory Quality System Manual as required by the contract documents. These procedures must conform to the applicable codes or standards referenced above.

9. INSPECTION, MEASURING AND TEST EQUIPMENT

9.1. Purpose

This chapter establishes the requirements to verify that inspection, measurement and testing equipment is identified, controlled, calibrated, and maintained in order to demonstrate the conformance of work to the specified requirements.

9.2. Scope

The requirements in this chapter apply to equipment, including software and hardware; used to verify quality of materials and products by means of inspection or testing.

9.3. Requirements

9.3.1. Inspection, measurement and test equipment shall be uniquely identified and meet either international or national standards for its intended use. When no international or national standards exist, a documented internal standard shall be developed for that equipment.

9.3.2. Equipment calibration frequency shall be established and the results documented per the requirements of Chapter 4 – Document Control – and Chapter 13 – Quality Records – of this QAP.

9.3.3. Equipment calibration status shall be clearly identified on the equipment and should at least include a calibration due date. When marking the equipment is difficult or not possible, the status records shall provide information about the calibration date and expiration.

9.3.4. The equipment shall be maintained and stored in a way that prevents damage from adverse environmental conditions. Equipment that is damaged or out of calibration shall be clearly identified as out of service and segregated to prevent inadvertent use.

9.3.5. Inspection and test results traced to out-of-calibration equipment shall be assessed and documented through a NCR.

9.4. Responsibilities

9.4.1. Organizations in charge of inspection, measurement and testing are responsible for establishing, performing and documenting the calibration procedures described in this section. .

9.4.2. The Material Engineer Supervisor[1] is responsible to inform CD QA/QC Director if out-of-calibration equipment was used for QC or IA testing. A NCR shall be issued documenting the details of that event. .

9.5. Procedure

The MBTA QC Materials Testing Laboratory Quality System Manual includes procedures for the control of Inspection, Measurement and Test Equipment.

1-See Figure :2 MBTA QA/QC Org Chart

10. INSPECTION AND TEST STATUS

10.1. Purpose

This chapter establishes the requirements for identifying the inspection and test status of work or material during production and installation.

10.2. Scope

The requirements in this chapter apply to all inspections and tests perform during production and installation of materials, products and equipment.

10.3. Requirements

10.3.1. Procedures and processes shall be established to identify the inspection and test status of work or materials to ensure that only those items that meet project requirements are incorporated into the project.

10.3.2. Materials which are found to not meet project requirements shall be identified by tags, marking, labels, stamps, inspection records or other suitable means including physical segregation. A Nonconononforamce report shall be generated.

10.3.3. Status of nonconforming items shall be kept as an ongoing record in the daily inspection reports. Nonconforming items shall be tracked and comply with the requirements established in Chapter 11 – Nonconformances – of this QAP.

10.4. Responsibilities

10.4.1. The Contractors QC Plan shall document how non-conforming items will be identified and who will be designated to apply and remove the status indicators. The same plan will designate who is responsible for maintaining status records.

10.4.2. The CD Resident Engineer is responsible for maintaining records of inspection and test performed by MBTA Field Inspectors. The procedures for keeping such records shall conform to the requirements establish in Chapter 13 – Quality Records – of this QAP. Details of this procedure shall be documented in the CD RE manual.

10.5. Procedure

The procedures for Quality Control Inspection and Test Status are captured in the contractor/fabricator's QC Plan.

11. NONCONFORMANCE

11.1. Purpose

This chapter establishes the requirements for documenting conditions affecting quality during design and construction.

11.2. Scope

The Nonconformance requirements established in this chapter apply to non-compliant materials, methods or activities in need of improvement. These items could be identified in processes, procedures or materials used or developed by CD, consultants or contractors.

11.3. Requirements

11.3.1. A nonconformance system shall be established and documented by the organization performing work for CD (designer, general contractor, fabricator, etc) as part of their approved quality program. This system must include procedures to identify, document, and evaluate nonconformances.

11.3.2. A nonconformance can be identified and documented by any personnel, but a standardized method to record file and track it shall be used.

11.3.3. The NCR tracking (sequential number and log) will be performed by those contracted by CD to perform work for the MBTA.

11.3.4. Nonconformances shall be reviewed to identify any trends in deficiencies. Trends for individual projects will be reviewed by responsible party (designer GC, etc). Overall trends will be reviewed at least annually by CD's QA/QC department.

11.3.5. Nonconformances shall be resolved through corrective actions. Corrective actions shall follow the requirements of Chapter 12 – Corrective Action – in this QAP.

11.3.6. Nonconforming items shall be clearly identified or segregated to prevent inadvertent installation or use. This identification/segregation is the responsibility of the group performing work for the MBTA. Specific procedure for controlling nonconforming work and resolution will be included in individual project's quality plan.

11.3.7. Reworked or repair work shall be re-inspected in accordance with established procedures.

11.3.8. All resolution of nonconformances shall be approved by the QA/QC Director from CD.

11.4. Responsibilities

11.4.1. As part of their approved quality plan, consultants and general contractors will document frequency of reviewing project specific trends of their nonconformances.

11.4.2. CD's QA/QC derpartment is responsible to review the status, tracking and trending of all nonconformances. That status will be reported to the CD AGM at least annually. Further, the trends will be utilized as a basis for focus of future audits.

11.5. Procedure

The specific procedure about Nonconformance is captured in Quality Assurance Procedure 12.1 –Problem Reporting and Resolution.

12. CORRECTIVE ACTION

12.1. Purpose

This chapter establishes the requirements for investigating, documenting, correcting, and preventing recurrence of nonconformances or activities in need of improvement.

12.2. Scope

The Corrective Action requirements established in this chapter applies to nonconformances or activities in need of improvement. These activities could be identified in processes, procedures or items (materials, product, equipment, etc.) used or developed by CD, Consultants or Contractors.

12.3. Requirements

12.3.1. A Corrective Actions system shall be established and documented. This system should include procedures to investigate root cause, disposition and prevent recurrence of nonconformities.

12.3.2. Procedures shall include methods to track, resolve and measure the effectiveness of corrective actions.

12.3.3. An organization or individual responsible to resolve corrective actions shall be identified.

12.3.4. The specifier (Chief Engineer, Designer, PM) and CD QA/QC are responsible to approve corrective actions

12.3.5. Corrective actions involving common work should be documented as lessons learned and be accessible to everybody in the organization.

12.4. Responsibilities

12.4.1. QA personnel should track, verify and measure the effectiveness of corrective actions as part of the nonconformance trend tracking and evaluation process.

12.5. Procedure

The specific procedure about Corrective Action is captured in Quality Assurance Procedure 13.1 – Corrective Action.

13. QUALITY RECORDS

13.1. Purpose

This chapter establishes the requirements to ensure Quality Records (physical and electronic) are properly stored, controlled, maintained and disposed.

13.2. Scope

The Quality Records requirements established in this chapter applies to CD and the Consultants and Contractors who perform work that may affect the quality of MBTA services and infrastructure.

13.3. Requirements

13.3.1. A Quality records control system shall be defined and documented by CD's Director of Document Control. This system should identify which records should be kept, responsibility for production and collection, and responsibility for indexing, filing, storage, maintenance, and disposition of quality records.

13.3.2. The records developed during and after completion of the project are considered quality records and shall follow the requirements established herein.

13.3.3. Quality records shall be controlled such that different versions are properly identified and traceable..

13.3.4. Retention and final disposition time of these records shall be clearly specified in the Document Control procedure.

13.3.5. Quality records shall be legible, and be protected from the environment to minimize deterioration and damage.

13.3.6. Access to quality records shall be controlled to prevent alteration, damage or loss.

13.3.7. Electronic data shall be backed up and the frequency to do so established in the Document Control Procedure.

13.3.8. Quality records shall be made available to authorized persons as required.

13.3.9. Quality Records shall be stored remotely in accordance with the Document Control Procedure such that file retrieval could be completed in a timely manner.

13.4. Responsibilities

13.4.1. CD is responsible for collecting all quality records at project close out.

13.5. Procedure

The specific procedure about Quality Records is captured in Quality Assurance Procedure 14.1 – Quality Records.

14. AUDITS

14.1. Purpose

This chapter establishes the requirements to implement an internal and external audit system. Audits are performed to review processes implementation and to identify items, services, procedures and processes in need of improvement. Audits can also identify best practices that can be duplicated as appropriate by other organizations.

14.2. Scope

This chapter will be used to identify conformance to quality procedures defined in contract specifications, this QAP and the QMS by CD, consultants, contractors and suppliers.

14.3. Requirements

14.3.1. Procedures to perform internal and external quality audits shall be developed and documented.

14.3.2. A schedule for internal and external quality audits shall be developed annually. Status of the audits will be updated monthly

14.3.3. Internal and external Quality Audits shall assess at least one element of the applicable quality program every year.

14.3.4. Audit documentation shall include an audit plan and an audit report. Documentation shall be distributed to auditees and auditors accordingly before and after the audit has been performed.

14.3.5. Quality audits that identify activities in need of improvement shall be documented as nonconformances and follow the requirements of Chapter 11 – Nonconformance.

14.3.6. Quality audits shall be performed by personnel independent of those having direct responsibility for the activity being audited.

14.3.7. Personnel identified in the audit plan should attend the meetings established in it.

14.3.8. Documentation requested by auditors in the audit plan shall be made available commensurate with the audit plan scope. Failing to provide such documentation will be identified as a nonconformance in the audit report.

14.4. Responsibilities

14.4.1. The QA/QC organization is responsible for developing the internal and external audit procedures.

14.4.2. The QA/QC organization in conjunction with human resources department are responsible for establishing the qualifications of a lead auditor. Additional auditors should be trained on the QA/QC audit procedures, these procedures must comply with Chapter 15 – Training – of this QAP.

14.4.3. Auditees are responsible to provide a working area for auditors to meet and perform their audit duties.

14.5. Procedure

The specific procedures required to conduct Audits is captured in Quality Assurance Procedure 15.1 – Audits.

15. TRAINING

15.1. Purpose

This chapter establishes the requirements for a training system that will provide personnel the knowledge and skills to perform their work.

15.2. Scope

The requirements in this chapter apply to CD personnel, consultants and contractors.

15.3. Requirements

15.3.1. A training system to prepare personnel on specific job responsibilities, familiarization of the QMS, and continued training for maintaining job proficiency shall be defined and documented.

15.3.2. This system shall clearly differentiate between the safety and technical training aspects of their work, this system must include and demonstrate that employees have the technical qualifications to perform their job.

15.3.3. Records of the education, experience, and training provided to employees shall be maintained and documented.

15.3.4. A frequency to evaluate the training system shall be established and the outcomes documented.

15.3.5. A training plan that lays out a path for employees to obtain appropriate training should be developed and documented.

15.4. Responsibilities

15.4.1. QA/QC personnel at CD are responsible for preparing, documenting and administrating the quality training material.

15.5. Procedure

Training and certification of inspectors at CD is captured in Quality Assurance Procedure 16.1.