

Section 6.2 Volume II

PRECAST CONCRETE PIPE

6.2.1 PURPOSE

This procedure provides guidance for the development and implementation of the Quality Control (QC) Programs for the manufacture, storage, and transportation of the precast concrete pipe (Pipe) for the Florida Department of Transportation (Department) projects. The Pipe may include, but are not limited to, round concrete pipe, elliptical concrete pipe, mitered end sections, and underdrain pipe.

6.2.2 AUTHORITY

Sections 334.044(10)(a) and 334.048(3), Florida Statutes

6.2.3 REFERENCES

Code of Federal Regulations (CFR), Federal-Aid Policy Guide (FAPG), Subchapter G – Engineering and Traffic Operations, Part 637 – Construction Inspection and Approval, Subpart B – Quality Assurance Procedures for Construction

Standard Plans for Road and Bridge Construction, Topic No. 625-010-003, Florida Department of Transportation (FDOT)

Florida Department of Transportation Standard Specifications for Road and Bridge Construction

American Society for Testing and Materials (ASTM) Standard Test Methods and Specifications

American Association of State Highway and Transportation Officials (AASHTO), Part I Specifications, and Part II Tests

Approved Product List (APL), Florida Department of Transportation

Materials Acceptance and Certification system (MAC) QC Program Maintenance User Manual

6.2.4 SCOPE

This procedure is used by the Pipe Manufacturers (Plants). These requirements and activities pertain to the inspections, measurements, and necessary tests to substantiate materials and Pipe in conformity with the **Contract Documents**. The Plant's QC Plan is designed to provide guidelines

that are used by the Plants to produce Pipe in conformance with the **Specifications** and other **Contract Documents**.

6.2.5 GENERAL INFORMATION

The Plants are responsible for the production, inspection, storage, and shipment of the Pipe. Ensure that the delivered Pipe to the project site meet the requirements of the **Specifications**, **Plans** and other **Contract Documents**.

6.2.6 PLANT QUALIFICATION PROCESS

6.2.6.1 General

Prepare the Plant's proposed QC Plan in accordance with **FDOT Specifications Section 105**. Submit the proposed QC Plan to the Department's District Materials and Research Office (DMRO) for the District in which the Plant is located. For out-of-state Plants, submit the proposed QC Plan to the Department's nearest DMRO. Upon the Plant's submittal of a QC Plan, the DMRO will review the proposed QC Plan and make necessary arrangements for the initial Plant qualification review in accordance with **Section 6.2.6.3**.

6.2.6.2 Review of the Plant's Proposed QC Plan

In the QC Plan, include the work experience, qualifications, and responsibilities of the Plant's production and QC personnel. Identify the on-site production manager, plant general manager, QC inspectors/technicians, and QC manager. Identify the responsibilities for monitoring key quality attributes and QC data. Include the applicable information required in **FDOT Specifications Sections 105 and 449**. Include a management statement of dedication to quality. Include a copy of the Plant's available repair methods for repair of minor deficiencies.

Complete the Precast Concrete Pipe Producer QC Plan Checklist (**Appendix B12**) and submit it with the QC Plan. The checklist can be found at the following link.

<https://www.fdot.gov/materials/quality/programs/qualitycontrol/checklists/index.shtm>.

When requested by Department inspectors, **American Concrete Pipe Association (ACPA)** certified Plants are required to provide the two most recent ACPA inspection reports, including the Plant's responses to the deficiency reports, if applicable.

6.2.6.2.1 Source of Supply

The Plant shall comply with the Build America, Buy America Act (BABA), in accordance with **FDOT Specifications Section 6** (Source of Supply).

At the beginning of each project, provide a notarized certification on the Plant's letterhead to the Engineer stating that the Pipe will be manufactured in accordance with the requirements set forth in the **Contract Documents**, the Plant's accepted QC Plan, and **FDOT Specifications Section 6** (Source of Supply). Provide an example copy of this certification in the QC Plan. Examples of acceptable material certifications can be found at the following link.

<https://www.fdot.gov/materials/administration/resources/library/publications/certifications/sampleforms.shtm>.

The Plant shall track steel and iron usage to declare the dollar amount of any foreign steel or iron on each delivery ticket. The QC Plan shall include the following:

- A. Methods for tracking the placement of all quantities of foreign steel and iron. Implement an accountable system that tracks the monetary value of foreign steel or iron used in each product.
- B. Methods and locations for segregating foreign steel and iron stockpiles from domestic steel and iron stockpiles.
- C. Methods for identifying and cataloging finished products containing foreign steel or iron.
- D. An example delivery ticket which includes both a Buy America compliance statement, and the dollar amount of foreign steel or iron used in the finished products for each delivery. The Buy America compliance statement and the dollar amount of foreign steel and iron shall appear on each delivery ticket. If no foreign steel or iron is used, then \$0 shall be declared.

6.2.6.3 Plant Qualification Review

The Department will perform the qualification review of the Plants. A qualification review includes an in-depth inspection by the Department of a Plant that submits its first QC Plan and Plants that have not produced for Department projects for more than a year.

6.2.6.4 Maintenance of Plant QC Plan and Qualification

Upon the Department's satisfactory review of the proposed QC Plan and a satisfactory Plant qualification review, the DMRO will accept the proposed QC Plan and include the Plant on the Department's **Production Facility Listing**. Immediately notify the DMRO in writing of any changes to the QC Plan. In case of change(s), revise the QC Plan annually in the form of addenda or complete revision of the entire document. Submit the revised QC Plan or its addenda to the DMRO annually. Any revisions to an accepted QC Plan shall be submitted and accepted by the DMRO prior to the implementation of the changes.

Plants that are on the Department's **Production Facility Listing** will be subject to the Plant qualification review or routine verification inspection at any

time. At a minimum, quarterly verification inspections will be performed by DMRO personnel. The Plants with an acceptable QC Plan, a satisfactory Department qualification review, and continued satisfactory verification inspections are qualified Plants.

Finished product storage areas shall provide adequate space for Department verification inspection that allows reasonable room for inspection of all surfaces. Pipe shall not be stored in overgrown areas where inspection is not possible.

If the Plant has not produced for Department projects for three consecutive quarters, the verification inspection frequency will be reduced to once every three quarters until the Plant produces for Department projects again. The frequency will revert back to once per quarter immediately after the Plant reinitiates production. The QC manager is responsible to inform the DMRO at least two weeks before the Plant resumes production for Department projects.

6.2.6.5 Maintenance of MAC Company and Production Facility Profile

During the Plant Qualification process, a Production Facility Profile (and a Company Profile if it does not yet exist) will be created in MAC. A Plant representative is responsible for acquiring the necessary Profile Manager roles within the system and maintaining contact information for the Profile Manager and Contact Person.

The Plant representative is responsible for uploading a copy of the Plant's QC Stamp to the Documents tab of the MAC Production Facility Profile.

6.2.6.6 Photographs and Videos

Allow Department representatives to take photographs of disputed infractions occurring within the manufacture of products designated for Department use. Photographs and videos will be taken for documentation and timely resolution of possible concerns observed and disputed by the facility during Department Plant inspections.

If Department inspectors observe a product or action that they feel is in violation of a **Specifications, Materials Manual** or QC Plan requirement and before a photograph or video is taken, the Department representative will attempt to notify the Plant's QC personnel of the existence of any infractions. No photograph or video will be taken if the infraction is immediately resolved to comply with the **Specification** in question.

If Plant personnel cannot be contacted or cannot respond in a timely manner that would otherwise result in a loss of photographic evidence, then a photograph or video may be taken of the specific infraction. The Plant's QC personnel may dispute the existence of the infraction, in such case the Department representative may photograph the questionable infraction. The

Plant will be allowed to review and comment on all photographs, videos, and documentation within 48 hours of their receipt by hand delivery or email.

The Department will coordinate with the Plant in advance to make arrangements for photographs and videos that will be taken for educational and/or technical publications.

6.2.7 FUNCTIONS AND RESPONSIBILITIES OF PIPE PLANTS

6.2.7.1 General

The Plants are responsible for the quality of the finished Pipe. Provide facilities and qualified QC personnel to perform specified inspections and tests and maintain an acceptable QC program in compliance with the requirements specified herein and the **Specifications**.

6.2.7.2 Quality Control Manager

The QC manager is responsible to ensure that the quality of the products at each Plant meets the quality requirements of the **Specifications** and other **Contract Documents**. The QC manager may serve in more than one Plant. The responsibilities of the QC manager include, but are not limited to, the following:

- A. Maintains the QC approval stamp and applies it to acceptable Pipes, or designates a technician, who is working under his/her direct supervision to apply the Plant approval stamp. The Plant approval stamp mark shall be legible and applied to each Pipe before its shipment to the project site. The QC stamp shall include the Department assigned Precast Concrete Pipe (PI) number.
- B. Be present, or designates a QC technician/inspector working under his/her direct supervision to be present, during the production of all Pipe products that will be shipped to Department projects.
- C. Performs and/or supervises the QC testing and inspection.
- D. Ensures that the Plant has a sufficient number of QC technician(s)/inspector(s) to maintain adequate inspection and testing during the production of Pipe for Department projects. In lieu of a permanent staff, the Plant may retain the services of an engineering consulting firm or qualified laboratory meeting the requirements of **FDOT Specifications Section 105**.
- E. Ensures that the testing equipment is properly maintained in accordance with the applicable test methods and specifications. Makes readily available, the current certification on testing equipment that is requiring calibration.
- F. Visually inspects or ensures that a qualified technician inspects each Pipe section before it is shipped to the project site.

- G. Ensures that all materials used to manufacture Pipe are from a Department accepted source.
- H. Maintains a daily production log of the manufactured Pipe.
- I. Ensures that all Pipe sections are properly stored and marked with the Plant's name and number along with other information that is required in the applicable ASTM or AASHTO standards.
- J. Maintains the QC files of material certifications, test data, and inspection results.
- K. Arranges at least quarterly meetings with the Department's verification inspector and representatives of the Plant's QC and production personnel when the Plant is producing for Department projects or according to the reduced frequency schedules to discuss any deficiencies and QC issues. Provides minutes from these meetings to the DMRO.

6.2.7.3 Quality Control Technicians/Inspectors

The QC technicians may perform any or all of the inspections, sampling, or testing as directed by the QC manager, and may stamp the Plant approved Pipe, when directed by the QC manager.

6.2.7.3.1 Level I Quality Control Inspector

Level I QC inspectors perform routine inspection and testing of the Pipe products, including but not limited to materials, pre-pour forms, reinforcing steel/fiber placement, concrete placement, curing, and post-placement inspections of finished products. The QC inspectors shall demonstrate sufficient knowledge of the Plant's QC functions to perform their job responsibilities as defined in the QC Plan, including but not limited to shop drawings, **Specifications**, **Standard Plans**, and test methods.

6.2.7.3.2 Level II Quality Control Inspector

In addition to the responsibilities of level I QC inspectors, level II QC inspectors may be involved in the design and verification of concrete mixes, and may evaluate the Plant's repair methods and their implementation. Level II inspectors shall demonstrate understanding of all aspects of the QC functions as defined in the QC Plan, including but not limited to shop drawings, **Specifications**, **Standard Plans**, and test methods.

6.2.7.4 Quality Control of Certified Materials

6.2.7.4.1 General

Ensure that all materials used to manufacture Pipe are from Department approved sources and comply with all requirements as specified herein.

6.2.7.4.2 Reinforcing Steel and Welded Wire Reinforcement

The QC inspectors shall obtain steel manufacturer's certifications for all welded wire reinforcement (WWR) and reinforcing steel that are used to manufacture Pipe. These certifications shall indicate compliance with the appropriate ASTM or AASHTO standards for wire, WWR, and for steel bars. Upon request, provide samples for the Department verification inspectors from at least one randomly selected LOT of reinforcing steel and WWR every six months. The Department will perform the testing of these samples. A LOT is defined as a single vehicle load of reinforcing steel or WWR of the same grade and manufacturer that is delivered to the Plant. Reinforcing steel and WWR shall meet the requirements of **FDOT Specifications Section 415**. Provide access and cooperate with verification inspectors during sampling of reinforcing steel.

6.2.7.4.3 Coarse and Fine Aggregates

The aggregates delivery tickets shall include the following information:

- A. Name of producer
- B. Location of mine
- C. Department pit number
- D. Department material code
- E. Delivery date
- F. Aggregate producer's certification statement with each shipment indicating that the shipped products comply with the **Specifications**.

Maintain each size of aggregate and mine source in separate stockpiles. Each stockpile shall be labeled with the Department Identification pit number. Prevent the contamination, segregation, or intermingling of stockpiled aggregates of different sizes with each other.

6.2.7.4.4 Cement

Accept the delivered cement based on the cement producer's certification indicating compliance with **FDOT Specifications Section 921**. A certification for each shipment of cement is required.

6.2.7.4.5 Supplementary Cementitious Materials

Accept supplementary cementitious materials based on the supplier's certification indicating compliance with **FDOT Specifications Section 929** and other **Contract Documents**. A certificate for each shipment of supplementary cementitious materials is required.

6.2.7.4.6 Batch Water

Water used for mixing concrete shall comply with **FDOT Specifications Section 923**.

6.2.7.4.7 Chemical Admixtures

Admixtures shall meet the requirements of ***FDOT Specifications Section 924***. The Department allows the use of admixtures by one of the following qualification processes:

- A. The admixtures that are listed in the ***FDOT Specifications Section 924*** are required to be on the Department's ***APL***. The manufacturer must use the products that are included as part of this list.
- B. As part of the Plant's QC Plan, the DMRO reviews and approves the use of admixtures that are used for workability, ease of machine processing, and better consolidation of dry-cast concrete Pipe and other machine formed concrete products. The approval of the admixture as part of the Plant's QC Plan indicates that the admixture has been given contingent approval, as evidenced by previous tests and its apparent effectiveness under field conditions. This approval will continue as long as the admixture performs as claimed. For the use of reinforced concrete products, the concrete admixtures shall not contain calcium chloride or calcium chloride-based ingredients.

6.2.7.4.8 Gasket Material

The gasket materials shall conform to the requirements of ***FDOT Specifications Section 942***. The acceptance of gaskets is based upon successful hydrostatic testing in accordance with the requirements of the ***Specifications*** and ***Section 6.2.7.9.3*** herein. A copy of the certification of compliance for each type of approved gasket must be maintained in the QC files and identified in the QC Plan. Prior to use, store gaskets in accordance with recommendations of the gasket manufacturers. The verification inspector may sample gasket materials at the discretion of the DMRO.

6.2.7.4.9 Gasket Lubricants

The producers of the gasket lubricant shall provide a certification statement indicating compliance with requirements of the ***Contract Documents***.

6.2.7.4.10 Patching Materials

All patching compounds shall comply with ***FDOT Specifications Section 449***. Pre-mixed packaged compounds may be used, when it is listed on the ***APL***. Cosmetic defects may be repaired in accordance with ***FDOT Specifications Section 450***, when it is approved by the DMRO as part of the Plant's QC Plan.

6.2.7.5 Quality Control of Concrete Production and Placement Equipment

Ensure that the batching and mixing equipment are capable of properly proportioning and mixing the various ingredients into a uniform mixture.

6.2.7.6 Calibration of Equipment

Check or calibrate all QC testing equipment such as the compressive strength testing machines, portable weighting scales, air meters, density buckets, calipers, and temperature recording devices for compliance with the applicable ASTM Specifications, and **Materials Manual Volume II, Section 9.2**. A reputable licensed testing laboratory shall calibrate all jacks and gauges for the three-edge-bearing test equipment at least once every twelve-month period.

6.2.7.7 Quality Control of Pipe Manufacturing Process

The following are the QC inspections and testing, related to operations prior to, during, and after concrete placement.

6.2.7.7.1 Concrete Mix Design

Unless otherwise shown on the project **Plans** or required by the **Specifications**, the concrete mix produced for the manufacture of Pipes shall comply with the strength requirements specified in **FDOT Specifications Section 449, ASTM C76** for reinforced concrete culvert, storm sewer Pipe, **ASTM C507** for reinforced concrete elliptical culvert, storm drain, and sewer pipe, **ASTM C985** for non-reinforced concrete. When requested, the Plant shall supply the verification inspectors a copy of each mix design. The mix design information shall include the source of aggregates, cementitious materials, and admixtures, along with the proportions of all ingredient materials.

6.2.7.7.2 Pipe Materials Storage

Store the rubber gaskets according to **FDOT Specifications Section 942**. Store the reinforcing steel in accordance with **FDOT Specifications Section 415**.

6.2.7.7.3 Forms

Verify the condition of the forms, especially their dented or bent areas. Inspect the rings to be compatible with the approved joint design and meet the requirements of the **Specifications**. The bands and grooves used to form the gasket recess shall comply with the approved design. The annular space of the joint shall be computed for compliance with the requirements of the **Specifications** and other **Contract Documents**.

6.2.7.7.4 Reinforcing Steel Placement

Randomly check the fabrication, positioning, and minimum concrete cover requirements of steel reinforcement. The QC inspection shall include the measurements and recording of the length, diameter, and reinforcing area of various sizes of cages currently being fabricated. The QC inspector shall verify

that all steel reinforcement meets the specification requirements. The minimum steel area requirements for Pipe shall be checked according to the following:

- A. **ASTM C76** for Round Pipe
- B. **Standard Plans, Index 430-001** for Bell and Spigot ends of Round Pipe
- C. **ASTM C507** for Elliptical Pipe
- D. Area requirements for special Pipe designs in accordance with the Approved Shop Drawings.

6.2.7.7.5 Concrete Mixture and Placement Operation

Mix and place concrete mixture in accordance with **ASTM C76**, **ASTM C507**, or any other applicable Standards to produce a homogeneous concrete.

6.2.7.7.6 Concrete Curing

The Pipe sections shall be cured in accordance with the applicable curing methods specified in **ASTM C76**, **ASTM C507**, or any other Standard curing method, or alternative curing method that is included as part of the Plant's QC Plan.

6.2.7.8 Quality Control Testing and Inspection of Pipe

6.2.7.8.1 General

For the acceptance of the Pipe, perform the QC inspection and tests at the frequencies and LOT (Group) sizes that are specified in the following AASHTO and ASTM Standards, unless **FDOT Specifications Section 449** and other **Contract Documents** have specified otherwise:

- A. **ASTM C76**, Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
- B. **ASTM C507**, Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe.
- C. **ASTM C985**, Standard Specification for Non-Reinforced Concrete Specified Strength Culvert, Storm Drain, and Sewer Pipe.
- D. **ASTM C1765** Steel Fiber Reinforced Concrete Pipe

The QC Plan shall include the QC test methods, inspections, and minimum frequency of tests that are used as the basis of acceptance of each type of Pipe. The QC inspectors shall obtain randomly selected samples from each LOT. A LOT is defined as the greater of one day's production or 300 sections of the Pipe. All sections of Pipe in a LOT shall be produced within 30-day time period. If a LOT is composed of Pipe with different strength requirements, the highest strength requirements will be applicable for the acceptance of all Pipe sections in the LOT. During the annual Plant qualification review, the Plant shall provide test data representing samples of all Pipe sizes that are

manufactured during the preceding year. Each LOT of Pipe components is accepted when:

- A. The test results and inspections meet the requirements as specified herein and in the applicable **Standard Plans** and **Specifications**.
- B. The Plant has completed all patching and repair work.
- C. The QC manager or his/her designated technician has stamped each section of Pipe.
- D. The list of the Pipe is included with each shipment to the project site.

6.2.7.8.2 Absorption Tests

Absorption tests are performed on steel reinforced Pipe at the minimum frequency of once per week for each Class of Pipe. The absorption test requirements are waived for wet cast concrete pipe.

If the last twelve consecutive absorption tests meet the requirements of **FDOT Specification Section 449**, then the sampling and testing frequency may be reduced to one sample every three months, as approved by the DMRO. If an absorption test fails once the frequency has been reduced, then the sampling frequency shall revert back to once per week for each class of pipe.

6.2.7.8.3 Hydrostatic Test on Pipe Joints

When a new gasket or joint design is introduced, perform the hydrostatic test in the presence of the QC and verification inspectors in accordance with **ASTM C497**. The test shall meet the performance requirements of **ASTM C443**, as modified in **FDOT Specification Sections 430 and 449**.

Hydrostatic testing will be subject to requalification after five years from the date of testing. Do not repeat testing on the same diameter in one Range until all other sizes from that Range has been tested, unless otherwise requested by the Department. The Pipe Joint Performance Test memorandum generated by the Department subsequent to a successful hydrostatic test shall be available in the Plant's QC Plan.

For Pipe with diameters 36 inches or larger, the Plant has the option to perform hydrostatic test on the Pipe joint by pressurizing the rubber gasketed joint either internally or externally. Upon approval, the test method shall be included as part of the Plant's QC Plan.

Tables 1 & 2 provide the range of Pipe sizes. Perform the hydrostatic test on one size within each range.

Table 1									
Hydrostatic Test Approval Size Ranges (Round)									
Range 1				Range 2			Range 3		
12"	15"	18"	21"	24"	27"	30"	33"	36"	42"
Range 4				Range 5			Range 6		
48"	54"	60"	66"	72"	78"	84"	90"	96"	
Note: All pipe sizes above 96" must be tested on each individual size.									

Table 2																
Hydrostatic Test Approval Size Ranges (Elliptical)																
Range 1				Range 2				Range 3			Range 4			Range 5		
18"	24"	27"	30"	33"	36"	39"	42"	48"	54"	60"	66"	72"	78"	84"	90"	96"
Note: All equivalent designated pipe sizes above 96" must be tested on each individual size.																

6.2.7.8.4 Appearance and Inspection of Final Finished Pipe

The QC manager or their designee performs final QC inspection of the finished Pipe, before the application of the QC approval stamp. Forms used to manufacture Pipe shall be sufficiently rigid and accurate to maintain the Pipe's designed dimensions and avoid irregularities in its surface. Pipe may be repaired if necessitated by occasional imperfections in the manufacture or damage during handling, and will be considered acceptable if the repairs are sound and properly finished to conform to the dimensional tolerances of the **Specifications**. Dimensional tolerances shall comply with the requirements of the applicable ASTM standards, except as modified in **FDOT Specifications Section 449**.

The QC inspectors shall perform visual inspection of all finished Pipe, measure the dimensions of at least 20% of the randomly selected units in each LOT, and maintain a record of the inspections, including the deficiencies. Minor deficiencies may be repaired in accordance with the repair methods included as part of the QC Plan. The Plant shall determine the cause of any repetitive non-conformances and develop a corrective action plan. Submit the corrective action plan to address the type of deficiencies and corrective action that will be taken to prevent or minimize deficiencies.

6.2.7.8.5 Handling and Storage

Pipe shall be handled and stored to prevent damage. The QC inspectors shall inspect the Pipe handling operations and appropriate practices that will prevent damage. The QC inspectors shall inspect Pipe during storage to ensure that they are stored in the correct stack and are not being damaged by point loading or stacking too high. Describe the method of storing Pipe in the QC Plan. Rejected Pipe shall not be stored in the same area with the acceptable Pipe. Rejected Pipe shall be culled and marked as rejected.

6.2.7.8.6 Stamping

Affix the Plant QC stamp to each section of Pipe. The QC stamp indicates that the manufactured Pipe meets the requirements of the **Contract Documents** and the QC Plan.

The Plant's QC stamp shall be clearly applied on the end of each section of Pipe, with waterproof paint. Include the QC stamp on the inside and the outside of opposite walls along the minor axis of the elliptical pipe, or along one vertical axis for round pipe.

The QC inspector shall inspect the identification and stamp marks on the wall of the Pipe to ensure that they are valid stamp marks. In the QC Plan include a statement that the Plant's QC stamp will be applied only on the Pipe that are manufactured for Department projects or any other projects that require Department verification inspection.

A copy of a certification statement from the general manager of the Plant shall be included in the QC Plan regarding the stamp configuration.

6.2.7.8.7 Shipment

Address the Plant's shipping policy as part of the QC Plan.

Ensure that at the beginning of each project, the Plant provides a notarized statement to the Department project administrator (PA) from a responsible company representative certifying that the Plant will manufacture the products in accordance with the requirements set forth in the **Contract Documents** and Plant's approved QC Plan. Ensure that each shipment of Pipe to the project site is accompanied with a signed or stamped delivery ticket providing the description and the list of the delivered Pipe.

Each delivery ticket shall include the list of Pipe being shipped, be on the Plant's letterhead and include as a minimum the following information:

- A. Financial Project Number
- B. Date Shipped
- C. Cast Date
- D. Type of Pipe

E. Quantity of Products

F. Serial Number

G. Buy America compliance statement and dollar amount of non-domestic steel and iron used in the finished products for each delivery.

The QC manager or designee shall stamp the Pipe prior to their shipment to the project site. Each shipment of the Pipe to the project site shall include the list of delivered Pipe. The Plant shall address the shipping policy as part of the QC Plan.

6.2.7.8.8 Documentation

The QC manager shall maintain documentation files in each Plant. Maintain these documents for a period of not less than three years after the last delivery of the Pipe to the project site. The QC documentation shall include the following items, as a minimum:

A. A copy of the approved QC Plan and addenda.

B. Approved shop drawings (if applicable).

C. Applicable ASTM and AASHTO standards.

D. Applicable **FDOT Specifications** and **Standard Plans**.

E. QC personnel training records.

F. Materials certification records for cement, aggregates, cementitious materials, chemical admixtures, fiber and steel reinforcing materials, welded wire reinforcement, and gasket materials.

G. Concrete mix designs.

H. Equipment calibration, including concrete batching equipment, water meter, admixture dispensing equipment, concrete compression testing machine, three-edge-bearing testing equipment, hydrostatic testing equipment.

I. Joint forming equipment and gaskets, and Pipe test results.

J. LOT number.

K. Number and type of Pipes in each LOT.

L. Applicable test data.

M. Disposition of all manufactured Pipe.

N. Record of the job specific shipping tickets, describing, size, type, and lengths of the delivered Pipe and the required notarized certification statement at the beginning of each project.

O. Record of all deficiencies found as a result of QC inspection and testing or verification inspection and testing and the corrective action taken. Maintain a copy of the deficiency reports in the Plant's permanent file.

- P. Minutes from quarterly meetings with verification inspector and representatives from the Plant's QC and production personnel.

6.2.8 TRAINING

6.2.8.1 General

The Plant's QC personnel who are involved in the inspection and testing of concrete Pipe shall have the required qualifications as specified in ***FDOT Specifications Section 105***.

The SMO maintains the list of the accredited concrete Pipe training courses. The list can be found at the following link.

<http://www.fdot.gov/materials/administration/resources/training/structural/index.shtm>

6.2.9 FORMS

None needed.