

Section 6.1 Volume II

FLEXIBLE PIPE (METAL AND PLASTIC)

6.1.1 PURPOSE

This procedure provides guidance for the development and implementation of the Quality Control (QC) Plan for the production, storage, and transportation of flexible pipes for Florida Department of Transportation (FDOT) projects. Types of flexible pipe, hereinafter referred to as pipe(s), include corrugated metal pipe (CMP), corrugated high-density polyethylene (HDPE) pipe, corrugated polypropylene (PP) pipe, corrugated polyvinyl chloride (PVC) pipe, and steel reinforced polyethylene (SRPE) pipe.

6.1.2 AUTHORITY

334.044(2), 334.044(10)(a), and 334.048 Florida Statutes

6.1.3 REFERENCES

Code of Federal Regulations (CFR), Federal-Aid Policy Guide (FAPG), Construction Inspection and Approval, Subpart B – Quality Assurance Procedures for Construction

Standard Plans for Road and Bridge Construction, Florida Department of Transportation.

Standard Specifications for Road and Bridge Construction, Florida Department of Transportation (Specifications).

Drainage Manual, Florida Department of Transportation.

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), Florida Department of Transportation.

Buy America Requirements – Code of Federal Regulations, Title 23 (23 CFR) Section 635.410.

Corrugated Polyethylene Pipe Design Manual and Installation Guide, Plastic Pipe Institute.

6.1.4 SCOPE

This procedure is used by flexible pipe Production Facilities to perform the required QC inspections and testing of raw materials and finished pipe. Each Production Facility QC Plan must document these requirements and all QC activities pertaining to the inspections, measurements, and necessary tests to substantiate that raw materials and finished pipes are in compliance with the ~~Florida Department of Transportation (FDOT) Standard Specifications for Road and Bridge Construction~~ and other **Contract Documents**. A Production Facility is defined as a system, at a specific physical location, dedicated to producing only one of the following categories of pipe:

- 1) Corrugated Metal
- 2) Corrugated PVC
- 3) Corrugated Polyolefin (HDPE and PP)
- 4) Steel Reinforced Polyethylene (SRPE)

Multiple Production Facilities may exist within a single physical location.

6.1.5 GENERAL INFORMATION

Production Facilities are responsible for the production, inspection, documentation, storage, and shipment of pipe. Pipe delivered to the project must meet the requirements of the ~~FDOT Specifications~~ and other **Contract Documents**.

6.1.6 PRODUCTION FACILITY QUALIFICATION PROCESS

6.1.6.1 General

Prepare the proposed QC Plan in accordance with ~~FDOT Specifications Section 105~~. Use the appropriate QC Plan checklist provided in **Materials Manual Section 5.6** as a guideline. Submit a separate QC Plan for each Production Facility. The Department will assign a unique

identification number for each Production Facility.

6.1.6.2 Review of Proposed Quality Control Plan

Submit the proposed QC Plan to the ~~District Materials and Research Office (DMRO) for the District in which the Production Facility is located~~ State Materials Office (SMO). ~~For out-of-state Production Facilities, contact the State Materials Office (SMO). The SMO or DMRO with oversight responsibility of the Production Facility's QC Plan is herein referred to as the Materials Office.~~ Upon the submittal of a QC Plan by the Production Facility, the ~~Materials Office~~ SMO will review the proposed QC Plan and make necessary arrangements to visit the Production Facility for the initial on-site Production Facility qualification review.

6.1.6.3 Production Facility Qualification Review

The ~~Department~~ SMO will perform the initial qualification reviews of the production facilities that intend to produce pipe for Department projects. These initial reviews include the reviews of Production Facilities that submit their first QC Plan and those that have not produced for Department projects for more than one year. The ~~Department~~ SMO will also perform routine qualification reviews at least annually, on all production facilities that have continued furnishing pipe for the Department's projects.

6.1.6.4 Maintenance of Production Facility Qualification

Upon the ~~Department's~~ SMO's satisfactory review of the proposed QC Plan, determination of compliance with ~~FDOT Specifications Section 105, Materials Manual Section 5.6~~, and satisfactory Production Facility qualification reviews, the ~~Materials Office~~ SMO will accept the proposed QC Plan and include the Production Facility on the Department's ***Production Facility Listing***. Notify the ~~Materials Office~~ SMO of any changes in the QC Plan and submit an addendum within 14 working days of the change. Obtain approval of the addendum from ~~the Materials Office~~ SMO prior to implementation and any subsequent shipment of pipe to FDOT projects. Revise and submit the QC Plan to the ~~Materials Office~~ SMO annually with a revised date and incorporate all addenda approved by the ~~Materials Office~~ SMO included since the last revision.

Production Facilities that are on the Department's ***Production Facility Listing*** will be subject to the qualification review process at any time. The ~~DMRO and~~ SMO will perform at least one annual review of the Production Facilities that are producing pipe for Department projects. The ~~DMRO~~ SMO will perform routine verification inspections of Production Facilities

at least ~~once per quarter~~ biannually.

If the Production Facility has not produced any FDOT products for one year ~~three consecutive quarters~~, the verification inspection frequency may be reduced until the Production Facility resumes production for FDOT projects. If a Production Facility has not been inspected by the ~~Department~~ SMO for more than one year, the QC Manager must notify the ~~Materials Office~~ SMO when the Production Facility intends to resume production for FDOT, such that an verification inspection by the SMO can be scheduled prior to production. A minimum notice of 10 working days shall be provided to the SMO prior to producing for a FDOT project.

6.1.7 PRODUCTION FACILITY FUNCTIONS AND RESPONSIBILITIES

6.1.7.1 General

Production Facilities are responsible for the quality of the finished pipes. A signed statement of compliance with all quality control requirements from the Production Facility's General Manager must be included in the QC Plan. Provide facilities and qualified personnel to perform specified inspections and tests and maintain an acceptable QC Plan in compliance with the requirements specified herein and in the FDOT Specifications.

Include in the QC Plan, the quality control related training, qualifications, and work experience of the QC personnel at the Production Facility. Identify the on-site Production Manager, General Manager, QC Inspectors/Technicians, and Quality Control Manager (QCM). Identify their responsibilities for monitoring quality control processes and quality control data.

Prior to the first shipment of pipe to each FDOT Project, the Production Facility must provide a Notarized Material Certification in accordance with FDOT Specifications Section 6. Include in the QC Plan, a completed ~~and notarized~~ example of the Notarized Material Certification.

Provide samples of raw materials and/or finished products for verification testing along with corresponding mill certifications, certificates of analysis (COA) and test reports as requested by the ~~Materials Office~~ SMO.

6.1.7.2 Quality Control Manager

The QCM ensures that the quality of the products at each Production Facility meets the quality requirements of the **Contract Documents**. The

QCM may serve in more than one Production Facility, if qualified. The responsibilities of the QCM include, but are not limited to, the following:

- 1) Maintain the Production Facility's Quality Control Labels and affix labels to acceptable sticks of pipe; or designate a qualified ~~quality control~~ **QC** technician, who is working under the direct supervision of the QCM to apply the Production Facility's QC Labels. QC labels must meet the requirements of **Materials Manual Section 6.1.14**.
- 2) Be present, or designate a QC technician/inspector working under the direct supervision of the QCM to be present during the production of all pipes that will be shipped to ~~Department~~ **FDOT** projects.
- 3) Perform and/or supervise ~~quality control~~ **QC** testing and inspection.
- 4) Ensure that the Production Facility has a sufficient number of **QC** trained ~~quality control~~ **QC** technician(s)/inspector(s) to maintain adequate inspection and testing during the production of pipes for ~~Department~~ **FDOT** projects. In lieu of a permanent staff to provide the required QC inspection and testing, the Production Facility may retain the services of an engineering consulting firm or laboratory meeting the requirements of ~~FDOT Specifications~~ **Section 105**.
- 5) Ensure that the QC testing equipment is maintained and calibrated in accordance with the applicable test methods and the ~~FDOT~~ **Specifications**.
- 6) Visually inspect each pipe before it is shipped to the project site, or ensure that a qualified QC technician performs the visual inspection.
- 7) Ensure that all materials used to manufacture the pipes are from sources that meet ~~FDOT Specification~~ requirements and are included in the QC Plan.
- 8) Maintain a daily production log showing raw material LOT numbers, pipe LOT numbers, inside diameters, and quantity of pipe produced. The production log must be used as a means of successfully tracking any pipe produced at that Production Facility.
- 9) Ensure that pipe joints comply with the hydrostatic testing

requirements of the **FDOT Specifications** and herein.

~~10)~~ **10)** Ensure that all pipes are properly stored and marked with the Production Facility's name and other information that is required in the applicable **ASTM** and/or **AASHTO Standards**.

~~40)~~ **11)** Maintain the files of raw material ~~certificat~~**COAs**ions, QC test data, QC inspections performed, nNotarized mMaterial cCertifications, and QC signed/stamped shipping tickets.

~~41)~~ **12)** Make necessary arrangements for ~~verification~~ inspections as requested by the ~~Department~~**SMO**.

~~42)~~ **13)** Execute certifications attesting to applicable specification compliance and include a detailed listing of the pipe type, inside diameter, and quantities.

~~43)~~ **14)** ~~Complete and sign/stamp shipping tickets; or A~~assign an authorized representative identified in the Production Facility's QC Plan to complete and sign shipping tickets.

6.1.7.3 Quality Control Technicians/Inspectors

Qualified QC technicians may perform all inspections, sampling, or testing as directed by the QCM, and may apply the QC label to the approved pipes, when directed by the QCM.

6.1.8 QUALITY CONTROL OF RAW MATERIALS

6.1.8.1 General

Ensure that all materials used to manufacture pipes are from sources identified in the QC Plan and comply with requirements as specified herein. Implement tracking methods that provide traceability of raw materials used for each production LOT. Include descriptions and examples of the tracking methods in the QC Plan, ~~descriptions and examples of the tracking methods~~. All raw material COAs shall be included in the QC Plan and be less than five years old.

One LOT of pipe is defined as a single production run not to exceed a maximum of seven days. Each pipe must bear legible markings identifying the pipe LOT information. Specify the Production Facility's definition for production LOTs in the QC Plan.

6.1.8.2 Metallic Materials (Coils, Ribs, Miscellaneous Components)

The Production Facility's QC personnel must obtain ~~certifications~~ **COAs** from the manufacturers of all metal coils, ribs, and miscellaneous metal components that are used in the fabrication of pipes, and will permanently remain with installed pipes. The delivered metallic materials must be inspected by QC for acceptance. The metal manufacturer's ~~certification~~ **COA** must indicate compliance with applicable **ASTM** or **AASHTO Standards**.

The ~~Department's Verification Inspectors~~ **SMO** will take samples, at each Production Facility, from at least two randomly selected LOTs of metal coil and ribs per year. One LOT is the entire volume of metal coil represented by the coil manufacturer's heat number. Meet the Buy America Requirements of **23 CFR 635.410**, as denoted in ~~FDOT Specifications Section 6~~, for steel source of supply. The Production Facility's QC Plan must include:

- (A) Methods and locations for segregating non-domestic, domestic steel and iron in storage at the Production Facility.
- (B) Methods for tracking the placement of all quantities of non-domestic steel and iron.
- (C) Methods for identifying and cataloging finished products containing non-domestic steel and iron.
- (D) An example shipping ticket with Buy America compliance statement and dollar amount of non-domestic steel and iron used in the finished products for each delivery.

Prior to the use of non-domestic steel materials on a project:

- (A) Include a statement in the ~~n~~Notarized ~~m~~Material ~~c~~Certification, sent at the beginning of each project, that all pipe will be manufactured in accordance with the Buy America Requirements of ~~FDOT Specifications Section 6~~ (Source of Supply–Steel).
- (B) Implement an accounting system that tracks the monetary value of non-domestic steel or iron used in each product.
- (C) In the event of contract modifications in which the use of non-domestic steel or iron is increased, obtain prior authorization from the Engineer.

6.1.8.3 Plastic Resins and Additives

The Production Facility's QC personnel must obtain the manufacturer's ~~certificates of analysis (COA)~~ for all plastic resins and resin additives that are used to manufacture pipes. The delivered plastic resins and additives must be inspected by QC for acceptance. The manufacturer's COA must indicate compliance with appropriate ~~FDOT Specifications~~, **ASTM**, and/or **AASHTO Standards**. A COA for each LOT of resin and additive is required. The plastic resins and additives must be stored such that ~~unintentional mixing mingling~~ and/or contamination are avoided. All resins must be identified in designated storage compartments. Resins must be identified by the resin manufacturer's LOT number. A resin LOT is defined as the entire volume of material represented by the LOT number. The ~~Materials Office~~ **SMO** will obtain samples from the ~~source or at the~~ pipe Production Facility. Sampling must be witnessed by the ~~Verification Inspector~~ **SMO**.

6.1.8.4 Gasket Material

Gasket materials must conform to the requirements of **ASTM D1056** for metal pipe and **ASTM F477** for plastic pipe. The approval of gaskets is based upon successful hydrostatic testing in accordance with the requirements of the ~~FDOT Specifications~~ and **Materials Manual Section 6.1.11.3** herein. A copy of the ~~certification of compliance~~ **COA** for each type of approved gasket must be maintained in the quality control file and identified in the QC Plan. Prior to use, store gaskets in accordance with recommendations of the gasket manufacturers. The ~~verification inspector~~ **SMO** may sample gasket materials at their discretion ~~of the Materials Office~~.

6.1.8.5 Gasket Lubricants and Adhesives

The manufacturer of the gasket lubricant(s) and/or adhesive(s) must provide a manufacturer's ~~certification statement~~ **COA** indicating compliance with requirements of the ~~FDOT Specifications~~. All lubricants and adhesives must be included in the Production Facility's QC Plan.

6.1.9 QUALITY CONTROL OF PIPE PRODUCTION

Ensure that pipe production equipment is capable of properly forming, shaping, or blending materials into pipe that meet the requirements of applicable ~~FDOT Specifications~~.

6.1.9.1 Calibration of Equipment

Ensure that all testing ~~apparatus is~~ devices are checked and calibrated

for compliance with the requirements of applicable **FDOT Specifications**. Use a calibration agency acceptable to the Department. Calibrations must be performed at least annually or more frequently as governed by applicable ~~Standards~~ standards or as recommended by the equipment manufacturer. All current calibration records must be kept on file at the QC office ~~of the QCM~~, and added to the QC Plan as an addendum.

6.1.9.2 Quality Control of Pipe Manufacturing Process

Perform and record daily checks at the beginning and end of each production run to ensure that the pipe geometry of each size produced meets **FDOT Specifications**. Quality control inspection must include visual inspection for defects, measurements of pipe diameters and lengths, dimensions of the corrugations, and recording of the results. Gage thickness and coating thickness must be checked for metal pipe. The inner and outer wall thickness must be checked for plastic pipe.

6.1.10 PIPE DESIGN, AND PIPE FABRICATION EQUIPMENT

6.1.10.1 Pipe Design

Prior to production, provide documentation to the project that the design of the pipe will satisfy all applicable portions of **ASTM** and **AASHTO Standards**, including **Contract Document** amendments thereto.

6.1.10.2 Pipe Fabrication Equipment

Inspect pipe manufacturing equipment daily and at the beginning of each production run. Inspect all components that are an integral part of the manufacturing equipment. Check all adjustable components for proper adjustment for the type and size of pipe being produced. Operate the pipe manufacturing equipment such that the production speed is within the limitations set by the equipment manufacturer. QC personnel must monitor production equipment for conditions that may cause damaged to pipes and take measures to prevent such conditions.

6.1.11 QUALITY CONTROL TESTING AND INSPECTION OF PIPES

6.1.11.1 General

Perform the applicable ~~quality control~~ QC inspections and/or tests

specified in the AASHTO and/or ASTM Standards for each type of pipe, unless modified by the ~~FDOT~~ **Specifications**. Additionally, for ~~high density polyethylene~~ HDPE and ~~polypropylene~~ PP pipes as defined in ~~FDOT~~ **Specifications Section 948**, perform QC/QA functions in accordance with the Plastic Pipe Institute's "**Corrugated Polyethylene Pipe Design Manual & Installation Guide**."

6.1.11.2 ~~Quality Control~~ QC Testing and Inspection

The QC Plan must include the ~~quality control~~ QC test methods, inspections, and minimum frequency of tests that are used as the basis of acceptance for each type of pipe. Dimensional checks of corrugations, wall thickness, pipe length and diameter must be made and recorded at the minimum frequency of twice daily. For plastic pipe, pipe density (weight per linear foot) must be either continuously monitored or determined twice daily. For plastic pipe, tests of pipe stiffness, environmental crack resistance and impact resistance must be made for each production run or at any time the materials LOT or source of supply changes or when the manufacturing process changes. For lock seam metal pipe, the joint cross section must be visually examined daily to ensure proper forming. Additionally, the tensile strength of lock seam pipe must be determined monthly or at any time visual inspection reveals discrepancies in joint forming. The Production Facility must ensure that the manufacturing process is such that metal claddings are not visibly damaged in any manner. Pipe with visible damage to the cladding must be marked, rejected, and stored separately. The cause of such damage must be immediately identified and eliminated. The ~~Materials Office~~ SMO may approve ~~or~~ direct modifications to the frequency of tests based on the performance history of the Production Facility.

Index tests derived from existing test methods may be developed and implemented by the Production Facility for QC purposes subject to the approval of the ~~State Materials Office~~ SMO.

Each LOT of flexible pipe, as defined in the QC Plan in accordance with **Materials Manual Section 6.1.8.1**, is accepted when all ~~of~~ the following requirements are satisfied:

- A) Prior to the first shipment of pipe to each project, a ~~n~~ Notarized ~~m~~ Material ~~c~~ Certification is sent to the project in accordance with ~~FDOT~~ **Specifications Section 6**.

- B) The QC test results and inspections meet the requirements as specified herein and in the ***FDOT Specifications***.
- C) The Production Facility has completed all patching and minor repair work using methods approved in the QC Plan.
- D) The ~~Quality Control Manager~~ **QCM** or the designated QC technician has applied QC labels to the pipes.
- ~~E)~~ Each shipment includes a QC signed or /stamped shipping ticket on the Production Facility's letterhead detailing the quantities, sizes, type, lengths, and mean inside diameter for each LOT of pipe.
- ~~E)~~ F) All required QC documentation has been completed and kept on file for QC activities.

6.1.11.3 Hydrostatic Testing on Pipe Joints

When requested by the ~~Department~~ **SMO**, perform hydrostatic tests at the pressures appropriate for the application (normally 5 psi). For plastic and reinforced plastic pipe, perform hydrostatic tests in accordance with **ASTM D3212**. PP and PVC pipe shall be tested for elongation tolerance in compliance with the Wall Zone Pipe requirements stated in the **Specifications** and **FDOT Drainage Manual**. QC inspection of the assembly and hydrostatic test must be performed to verify sealing of the assembled pipe joint(s), with a two-inch gap from the home position in both straight alignment and 5% deflection. For metal pipe, perform hydrostatic tests in accordance with the joint testing procedure specified in **ASTM A760**; deflect one side of the pipe to a 5% reduction in internal diameter using the parallel plate methodology of **ASTM D2412**.

For initial Production Facility qualification review, perform hydrostatic testing on the pipe sizes to be produced for FDOT projects. Hydrostatic testing performed on a pipe size may represent all sizes with the same joint design, gasket manufacturer and gasket profile in the respective Range (I–IV) identified in **Table 1**. Test each pipe size in Range V (greater than 96 inches) on an individual basis.

Perform hydrostatic tests in the presence of the Production Facility QCM, or designated QC technician, ~~verification inspector(s)~~ **SMO** and/or other personnel as deemed appropriate by the ~~Materials Office~~ **SMO**. The requirement for a ~~Department~~ **SMO** representative to be present at the time of testing may be waived if the Production Facility employs, at their

cost, an independent engineering inspection firm with drainage pipe experience (subject to the Engineer's prior approval) to witness the test, ~~and~~ provide a report, and complete the appropriate FDOT Pipe Joint Hydrostatic Performance Test Report. The Production Facility's QCM shall notify the SMO a minimum of 10 working days prior to the scheduled test. Testing may be performed off-site, provided that the pipe bears the QC label of the Production Facility where it was produced and the above requirements for witnessing are met at the test location.

All hydrostatic test reports must include the pipe size, type of joint (document the gauge thickness of metal bands), type of gasket, gasket size, ~~and~~ manufacturer of gasket, serial number of ~~the~~ gasket, date of test and names of witnesses. Additional joint designs and/or gaskets will require successful hydrostatic testing prior to approval by ~~SMO~~ the Department. ~~A template for hydrostatic test reports is provided in Appendix A.~~ Include all successful test reports in the QC Plan.

Hydrostatic testing for each Range will be subject to requalification after five years from the date of testing. Do not repeat testing on the same diameter in ~~one any~~ Range until all other sizes ~~from that Range in that Range has have~~ been tested, unless otherwise requested by the ~~Department~~ SMO.

Table 1 – Hydrostatic Test Size Ranges

Range	Inside Diameters (inches)
I	12 – 21
II	24 – 42
III	48 – 60
IV	66 – 96
V	Above 96

6.1.12 APPEARANCE AND FINAL INSPECTION OF FINISHED PIPES

Perform QC final inspection of the finished pipes, before the application of the QC label. Include in the QC Plan, the definition of repairable minor deficiencies and the available methods for repair of such deficiencies. Pipes may be repaired if necessitated by occasional minor imperfections during manufacturing, or damage during handling, and will be considered acceptable if the repairs are in accordance with the accepted QC Plan and are sound and properly finished to conform to the dimensional tolerances of the FDOT Specifications. All rerolled, and cut ends on metal pipe products must be deburred by power tool, solvent cleaned, and coated using zinc-rich coating meeting the requirements of FDOT Specifications Section 562. Corrugated metal pipe with welded seams (coil splices) will not be deemed

acceptable for FDOT projects unless both surfaces of the weld have been cleaned and fully coated using zinc-rich coating meeting the requirements of ***FDOT Specifications Section 562***. Comply with dimensional tolerances in conformity with the requirements of the applicable ***AASHTO*** and ***ASTM Standards*** as appropriate.

Perform visual inspection of all finished pipes. Measure the dimensions of at least five percent 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 approved by the ~~Department SMO~~ and included as part of the QC Plan ~~or as may be approved by the Materials Office~~. Determine the cause of the repetitive nonconformance and develop a corrective action plan for immediate implementation. Revise the QC Plan to address the type of deficiencies and the corrective action that will be taken to prevent or minimize the deficiencies.

6.1.13 HANDLING AND STORAGE

Handle, and store pipes using methods that prevent damage and contamination. Inspect the pipe handling operations and implement appropriate practices that prevent damage caused by conditions including metal to metal contact and impact or abrasion by forklift probes during handling and storage. Inspect pipes in storage to ensure that they are stored in the correct stack and are not being damaged by point loading, abrasion of cladding, or stacking too high. Do not store rejected pipes in the same area with the acceptable pipes. Store gaskets in accordance with the recommendations of the gasket manufacturer. When pipe is stored off-site at a separate physical location from the Production Facility, ensure all the above storage guidelines are met. All off-site storage facilities must be listed in the QC Plan and will be subject to annual inspection by the SMO. -

6.1.14 QUALITY CONTROL LABELS

The Production Facility must affix a QC label to each section of pipe, indicating that the pipe meets the requirements of the ***Contract Documents***. The Production Facility's QC label must be indelible and legible, and applied to the inside wall of the -end on each pipe before its shipment from the Production Facility to the project site. For pipes with bell and spigot joints, do not place QC labels inside or within the bell.

The QC label must include the Production Facility's identity, assigned FDOT

Production Facility number, LOT number and/or date manufactured, and the date of final ~~quality control~~ **QC** inspection. The label must consist of a tear and weather resistant polymer sticker with a durable adhesive, printed or marked with indelible ink, or other durable materials subject to approval by the ~~State Materials Office~~ **SMO**. An example of the QC label must be included in the QC Plan.

6.1.15 SHIPMENT

Pipe must be shipped directly from the Production Facility, or approved off-site storage facility, to the project site. Address the Production Facility's shipping policy as part of the QC Plan. Approved off-site storage facilities must adhere to shipping policies outlined in the Production Facility's QC Plan. Ensure that each shipment of pipe to the project site is accompanied with a shipping/delivery ticket signed by authorized personnel identified in the QC Plan. The shipping ticket must provide the description and the list of the products. The list of the products with each shipping/delivery ticket must be on the Production Facility's letterhead and must include as a minimum, project number, date shipped, identification and quantity of pipes and the mean diameter of the pipes.

The QCM or other designated QC personnel working under the direct supervision of the QCM must affix QC labels to the pipes prior to their shipment to the project site. The QC label indicates that the Production Facility certifies that the pipes ~~are~~ **is** manufactured in conformance with the Production Facility's accepted QC Plan.

6.1.16 DOCUMENTATION

The QC Manager must maintain QC documentation files at the Production Facility. These documents must be retained for a minimum of three years from the date of the Engineer's final acceptance of each specific FDOT project, unless a longer minimum period is otherwise specified. All QC documentation related to FDOT projects must be made readily available and accessible upon the ~~Department's~~ **SMO's** request. The QC documentation must, as a minimum, include the following items:

- A) A copy of the currently approved QC Plan ~~(including all amendments)~~
- B) Approved shop drawings (if applicable)
- C) Applicable **ASTM** and **AASHTO** ~~S~~ **standards**
- D) **FDOT Standard Specifications and Standard Plans for Road and Bridge Construction**

- E) ~~Department~~ SMO approved training courses and currently qualified QC Personnel
- F) ~~Certification records~~ COAs for raw materials
- G) Equipment calibration records, ~~(including pipe forming machines and QC test equipment)~~
- H) LOT numbers for raw materials and finished products
- I) Quantity and type of pipes in each LOT
- J) Applicable QC test data
- K) Disposition of all pipes
- L) Record of the pipes delivered to each project, including the minimum and maximum measured diameters for each LOT of pipe.
- M) ~~—~~Record of all deficiencies found during ~~verification~~ SMO inspections, and the corrective actions taken. A copy of the deficiency reports must also be maintained in the Production Facility's permanent file.
- ~~N)~~ Production Facility layout sheet denoting QC office, production area, storage area, material storage, entrances into the Production Facility, etc.
- ~~N)~~ QC inspection forms

6.1.17 TRAINING

The Production Facility must utilize ~~quality control~~ QC personnel who have met the training and certification requirements of the Production Facility's QC training program. The Production Facility's proposed QC training program must be submitted to the ~~State Materials Office~~ SMO for review and approval. Approval of a Production Facility's QC Plan is contingent upon approval of the QC training program for that Facility. The training program, at a minimum, must include:

- A) The method(s) of training personnel for the required QC monitoring, inspection and testing activities relevant to the type of flexible pipe produced and in accordance with applicable **ASTM** or **AASHTO Standards**.

B) The method(s) of training evaluation, such as examinations and how they are administered.

~~C)~~ The ~~period of time~~ duration that training certifications remain in effect before reevaluation and ~~recertification~~ requalification is required (maximum 5 years).

~~D)~~ _____
~~E)~~ C) _____

6.1.17.1 Quality Control Inspectors:

~~Quality Control~~ QC Inspectors are those who are performing routine inspection and testing of pipe products, including, materials processing, manufacturing equipment operation and finished product inspection and QC approval. The QC inspectors must be familiar with flexible pipe related **Plans** and ~~FDOT Specifications~~. The QC inspectors are also responsible for the evaluation of materials compliance with ~~Specifications~~ the applicable standards, proper operation of manufacturing equipment, and completing all required ~~quality control~~ QC documentation. QC inspectors must also be able to evaluate the necessity of pipe repair and implementation of the required repair method.

6.1.17.2 Quality Control Managers:

The ~~Quality Control Managers~~ QCM must ~~have a Pipe Quality Control Inspector qualification from~~ be qualified in accordance with the Production Facility's ~~Department~~ SMO approved training program and a minimum of two years of experience, directly related to the type of flexible pipe being manufactured.

6.1.17.3 Re-qualification of Quality Control Personnel:

~~The~~ Upon expiration of QC qualifications ~~will expire~~ at the end of five years, ~~during which, the inspectors QC personnel have the choice of attending the course and retaking the examination or they may elect to only take the examination to be~~ shall be re-qualified for an additional five years in accordance with the Production Facility's SMO approved QC training program. QC personnel with recently expired training qualifications will not be allowed to continue in a QC role without consent by the ~~Materials Office~~ SMO. Consent may be granted if the ~~Materials Office~~ SMO has verified QC enrollment of an approved training source

within 30 days. Failure to notify the ~~Materials Office~~ SMO of QC personnel qualifications can result in suspension of the Production Facility's QC Plan.

6.1.18 FORMS

The Production Facility must include all current FDOT Pipe Joint Hydrostatic Performance Test Reports (located in **Appendix A** and **Appendix B**) in the Production Facility's QC Plan. Test reports filled out by an independent engineering inspection firm must be approved and signed by the SMO.

APPENDIX A Blank Hydrostatic Test Report



PIPE JOINT HYDROSTATIC PERFORMANCE TEST REPORT

~~FDOT~~ Inspector:

Production Facility Name:

Pipe Diameter Tested:

Pipe Manufacture Date:

Pipe Diameter Represented:

Gasket Identification #:

Inspection Date:

Production Facility Location:

Type of Pipe:

Type of Joint/Band:

Gasket Manufacturer:

Report Date:

The visual inspection of the assembly and hydrostatic test of the pipe joint identified above were performed to verify performance in accordance with the requirements herein.

Standards/Requirements:

1. Section 948 of the Florida Department of Transportation Specifications.
2. ASTM D3212 Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
3. Materials Manual Chapter 6.1, Volume II

Test Set Up:

The Production Facility performed hydrostatic pressure testing on the joint assembly of two sections of pipe in accordance with the Florida Department of Transportation Specifications and Materials Manual. The assembly was subjected to a minimum internal pressure of 5 psi for a minimum of 10 minutes, both in the straight alignment and deflected positions, as specified in the Standard Specification.

Test Results:

The results of the inspection indicate that the hydrostatic test of the assembled joint met the requirements of the established standards. There was no visible leakage during the test. Based on the gasket manufacturer's certification and the results of the above performance test, the proposed rubber gasket may be used to seal assembled joints of the type and size of the pipes described above.

cc: ~~District Structural Materials Engineer~~
~~Pipe Production Facility~~

~~Gasket Manufacturer~~

FDOT State Materials Office

APPENDIX B **Blank Hydrostatic Test Report**



Florida Department of Transportation

605 Suwannee Street
Tallahassee, FL 32399-0450

ELONGATION TOLERANT PIPE JOINT **HYDROSTATIC PERFORMANCE TEST REPORT**

<u>Inspector:</u>	<u>Inspection Date:</u>
<u>Production Facility Name:</u>	<u>Production Facility Location:</u>
<u>Pipe Diameter Tested:</u>	<u>Type of Pipe:</u>
<u>Pipe Manufacture Date:</u>	<u>Type of Joint/Band:</u>
<u>Pipe Diameter Represented:</u>	<u>Gasket Manufacturer:</u>
<u>Gasket Identification #:</u>	<u>Report Date:</u>

The visual inspection of the assembly and hydrostatic test of the pipe joint identified above were performed to verify the sealing of the assembled pipe joint(s) with a 2-inch gap from the home position.

Standards/Requirements:

1. Section 430 and Section 948 of the Florida Department of Transportation Specifications.
2. ASTM D3212 Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
3. Materials Manual Chapter 6.1, Volume II

Test Set Up:

The Production Facility performed hydrostatic pressure testing on the joint assembly of two sections of pipe, with a 2-inch gap from the home position, in accordance with the listed standards/requirements. The assembly was subjected to a minimum internal pressure of 10.8 psi for a minimum of 10 minutes, both in the straight alignment and deflected positions, as specified in the standards/requirements.

Test Results:

The results of the inspection indicate that the hydrostatic test of the assembled joint met the requirements of the established standards. There was no visible leakage during the test. Based on the gasket manufacturer's certification and the results of the above performance test, the proposed rubber gasket may be used to seal assembled joints of the type and size of the pipes described above.

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