

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
MATERIALS CONTROL, SOILS AND TESTING DIVISION

MATERIALS PROCEDURE

QUALITY ASSURANCE OF REINFORCED CONCRETE CULVERT,
STORM DRAIN, AND SEWER PIPE

1. PURPOSE

- 1.1 To set forth the procedures which govern the Quality Assurance of Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
 - 1.2 To set forth manufacturers Quality Control requirements.
 - 1.3 To set forth acceptance inspection procedures.
 - 1.4 To set forth documentation and shipping procedures.
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2. SCOPE

- 2.1 This procedure will apply to all manufacturers of Reinforced Concrete Culvert, storm pipe, and sewer pipe for use in West Virginia projects.
 - 2.2 This procedure will establish the basis for acceptance of reinforced concrete pipe.
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3. APPLICABLE SPECIFICATIONS

- 3.1 All standard types of reinforced concrete pipe are to be manufactured and tested in accordance with Section 714.2 of the WVDOH Specifications for Roads and Bridges.
- 3.2 Each LOT of reinforced concrete pipe having a wall thickness of 4.5 inches or less, which is manufactured in accordance with the applicable specifications is treated in the following manner to determine acceptability.
 - 3.2.1 The three-edge bearing test (AASHTO T 280) shall be used to determine the force required to produce the 0.01-inch crack and the minimum specified ultimate load.
 - 3.2.1.1 50% of the LOTs of Class III and Class IV concrete pipe 24 inches in diameter and less, and conforming to WVDOT Specifications, will be accepted based on the Fabricator's certification, provided they are QCast Certified by the American Concrete Pipe Association (ACPA). Testing of Class III and Class IV concrete pipe greater than 24 inches in diameter shall be witnessed by the Division.
 - 3.2.1.2 50% of the LOTs of Class V Concrete Pipe with a diameter less than 24 inches, and conforming to WVDOT Specifications, will be accepted based on the Fabricator's certification, provided they are QCast Certified by the ACPA. Testing of Class V Concrete Pipe, with a diameter greater than or equal to 24 inches, shall be witnessed by the Division.

- 3.2.2 The absorption test (AASHTO T 280) shall be conducted on samples selected from the wall of the pipe.
- 3.2.3 A plant inspection of the finished product is conducted to determine dimensional conformance and freedom from defects.
 - 3.2.3.1 For LOTs of concrete pipe accepted on the Fabricator's certification, the inspection, including the three-edge-bearing test, will be performed and recorded by the Fabricator's Quality Control person. These LOTs shall be as defined in Table 1, but the sizes shall be based on the criteria in the QCast Certification program.
- 3.3 Each LOT of reinforced concrete pipe fabricated with dry cast concrete having a wall thickness greater than 4.5 inches, which is manufactured in accordance with the applicable specifications, is treated in the following manner to determine acceptability.
 - 3.3.1 The compressive strength of the concrete will be determined by testing cores taken from the wall of the pipe. The manufacturer may choose to test this pipe as specified in Section 3.2.1, in which event the requirements for the 0.01-inch crack and the minimum specified ultimate load shall be met. This choice shall not be applied to a LOT (refer to Table 1) of pipe, which has been previously cored and found unacceptable.
 - 3.3.2 The absorption test (AASHTO T 280) shall be conducted on samples selected from the wall of the pipe.
 - 3.3.3 A plant inspection of the finished product will be conducted by the Division to determine dimensional conformance, and freedom from defects.
- 3.4 Each LOT of reinforced concrete pipe fabricated with wet cast concrete can be accepted on the basis of compressive strength from cylinder breaks (cylinders made per AASHTO R 100 and tested per AASHTO T 22) reaching the required 28-day compressive strength or by the three-edge bearing test (AASHTO T 280) as detailed in Section 3.2.1.
 - 3.4.1 The absorption test (AASHTO T 280) for wet cast pipe shall be conducted on samples cored from the wall of the pipe or by making cylinders (4-inch x 8-inch minimum in accordance with AASHTO R 100).
- 3.5 Flared end sections will be accepted by either the inspection method or Fabricator certification method, with the same size criteria as outlined in Section 3.2.
 - 3.5.1 Acceptance by the inspection method of precast concrete flared end sections is to be based on verification of compressive strength of concrete as determined from cylinders or cores. Flared end sections must also meet the dimensional requirements listed on the standard detail and on appearance. The testing frequency for compressive strength cores and steel verification coring is 1 out of every 40 pieces, but cylinders shall be fabricated and tested for each piece, if cylinders are used for strength acceptance instead of cores.
 - 3.5.2 In order to accept flared end sections by the Fabricator certification method, the Fabricator must be QCast Certified by the ACPA. The fabricator will take photos/videos showing correct steel placement and cover for one piece in each LOT. All flared end sections must be fabricated within the dimensions listed on the standard detail and have an acceptable finish free of bug holes, spalls, cracks and other surface defects.

TABLE 1

SAMPLING AND TESTING FREQUENCY FOR REINFORCED CONCRETE PIPE

A production "LOT" is defined as follows:

It is a pipe of the same size and class that is manufactured using the same process and similar materials during continuous days of production. The production LOT shall not exceed the specified value of 1% of the LOT and the minimum number tested per LOT is as follows:

Number of Pipe Sections in the LOT	Number of Pipe Sections to be Tested
0 to 300	1
301 to 800	2
801 to 1500	3
over 1500	3 plus 1 section per each 600 pieces or fraction thereof over 1500 pc.

When the tests indicate that a production LOT is acceptable for WVDOH use, the LOT should be inspected by the Division's representative.

4. QUALITY CONTROL REQUIREMENTS

- 4.1 Quality Control is the responsibility of the manufacturer and shall include the following:
 - 4.1.1 Ensure all component materials used in the fabrication of the pipe have been sampled, tested, and approved (MP 603.02.10).
 - 4.1.2 Ensure quality workmanship as well as a quality product throughout the production.
 - 4.1.3 To scribe into each piece of pipe the following:
 - (a) Cast Date
 - (b) Class and Wall Type
 - (c) Manufacturer's Trademark
 - 4.1.4 Notify the Division's representative upon the completion of casting of a LOT (Refer to Table 1) of pipe so the Division may select a representative sample and witness the testing.
 - 4.1.5 To conduct the three-edge bearing test or to secure cores to ensure strength requirements are met (Section 3.2 and 3.3).
 - 4.1.6 To conduct the absorption test (AASHTO T 280) on samples selected from the wall of the pipe.

- 4.1.7 Any LOT of pipe or portion of a LOT of pipe failing to meet the specification requirements will be stored separately from acceptable pipe.
- 4.1.8 Accurate inventory records containing the information required in Section 6.1.2 will be kept and maintained by the manufacturer.

5. ACCEPTANCE CRITERIA

The Division will:

- 5.1 Sample and test the component materials to be used in the manufacturer of the reinforced concrete pipe in accordance with MP 603.02.10.
- 5.2 Select representative samples of the LOT to be tested and:
- (a) Witness the three-edge bearing test and/or the coring procedure
 - (b) Verify dimensional conformance
 - (c) Verify actual steel placement
 - (d) Determine the steel area
- 5.3 Ensure each piece comprising the LOT is scribed as stated in 4.1.3.
- 5.4 Make a visual inspection of the LOT and designate unacceptable units to be removed or set apart from the approved pipe in the LOT.

6. SHIPPING REQUIREMENTS

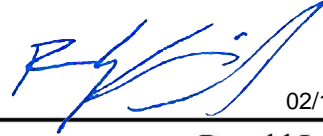
- 6.1 The approved LOT of pipe or portion of the LOT can be shipped by the manufacturer providing the following provisions have been met:
- 6.1.1 The manufacturer will notify the Division's representative prior to each shipment so that the Division may maintain a current inventory with the manufacturing plant.
- 6.1.2 The manufacturer will supply one copy of the shipping invoice to Materials Control, Soils and Testing Division and one copy to the Division's representative at the project site. The invoice shall contain the following information.
- (a) Cast date of the approved LOT
 - (b) Master laboratory reference number
 - (c) Size, class, and wall type
 - (d) Project number
 - (e) Number of pieces

7. ACCEPTANCE PRACTICE

- 7.1 Ensure the information on the shipping invoice, as required in Section 6.1.2, agrees with the shipment it accompanies. (Number of pieces, class, size, and type, etc.).
- 7.2 Check each piece of pipe for the proper identification markings (Section 5.3) and make a visual inspection of each piece to ensure there is no evidence of damage during shipment.

8. COVERAGE REQUEST FROM PROJECT SITE

- 8.1 Request for coverage shall include the information as referenced on the shipping invoice, Section 6.1.2



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MP 714.03.30 Steward – Cement and Concrete Section
RLS:Mg