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Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures and Corrugated High Density Polyethylene Drainage Pipes[1]

This standard is issued under the fixed designation F2510/F2510M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers the design, material, and minimum performance requirements of resilient connectors used for connections between reinforced concrete structures conforming to Specifications C478 and C913 to annular corrugated profile wall high density polyethylene (HDPE) drainage pipe conforming to AASHTO M252 or Specification F2306/F2306M.

1.1.1 These connectors are designed to provide a positive seal between the pipe and manholes or other structures subjected to internal and external hydrostatic pressures less than 10.8 psi [74 KPa].

1.1.2 Testing under this standard is limited to hydrostatic pressures. Alternate air and vacuum pressure testing involve unique testing protocols and are not addressed under this standard.

1.1.3 Testing under this standard is conducted in a laboratory as a proof of design certification. Actual field performance testing would be accomplished and accepted under individual project performance standards or pipeline acceptance criteria, which is outside the scope of this standard.

NOTE 1—Infiltration or exfiltration quantities for an installed system are dependent upon many factors other than the connections between manhole structures and pipe, and allowable quantities must be covered by other specifications and suitable testing of the installed pipeline and system.

NOTE 2—This specification may be applied to other types of plastic drainage pipe. Consult with manufacturer of pipe for applicability to this standard.

1.2 The values stated in either inch-pound units or SI units are to be regarded separately as standard. Within the text the SI units are shown in brackets. The values stated in each system may not be exact equivalents: therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

1.3 The following precautionary caveat pertains only to the test methods portion, Section 7. *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use. For a specific precaution statement, see 7.2.3.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

A493 Specification for Stainless Steel Wire and Wire Rods for Cold Heading and Cold Forging

A666 Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar

C478 Specification for Circular Precast Reinforced Concrete Manhole Sections

C822 Terminology Relating to Concrete Pipe and Related Products

C913 Specification for Precast Concrete Water and Wastewater Structures

D624 Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers

D746 Test Method for Brittleness Temperature of Plastics and Elastomers by Impact

D1566 Terminology Relating to Rubber

F412 Terminology Relating to Plastic Piping Systems

F477 Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

F2306/F2306M Specification for 12 to 60 in. [300 to 1500 mm] Annular Corrugated Profile-Wall Polyethylene (PE) Pipe and Fittings for Gravity-Flow Storm Sewer and Subsurface Drainage Applications

2.2 *Other Standards:*[3]

M 252 Standard Specification for Corrugated Polyethylene Drainage Pipe 75 to 250 mm Diameter

[1] This specification is under the jurisdiction of ASTM Committee F17 on Plastic Piping Systems and is the direct responsibility of Subcommittee F17.20 on Joining.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from American Association of State Highway and Transportation Officials (AASHTO), 444 N. Capitol St., NW, Suite 249, Washington, DC 20001, http://www.transportation.org.

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3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 Terms relating to plastics and rubber shall be as defined in Terminologies F412 and D1566, respectively.

3.1.2 Terms relating to precast concrete manholes and related products shall be as defined in Terminology C822 and as modified in 3.2,3.3, and3.4.

3.2 *connector*—the entire assembly including resilient seals and metallic or nonmetallic mechanical devices, if any, used therein.

3.3 *pipe*—the inlet or outlet pipe connected to the manhole.

3.4 *pipe stub*—a short section of pipe, installed in the structure as an inlet or outlet pipe, for future connection.

4. Materials and Manufacture

4.1 4.1 All materials shall conform to the following requirements:

4.1.1 Resilient materials for connectors and filler rings shall be manufactured from natural or synthetic rubber and shall conform to the requirements prescribed in Specification F477, Section 6, Low Head Physical Requirements for Elastomeric Seals for Plastic Pipe.

4.1.2 Low Temperature Brittle Point. Resilient materials for connectors shall display no fracture at -40ºF [-40ºC] when tested in accordance with Test Method D746.

4.1.3 Tear Resistance. Resilient materials for connectors shall meet a minimum tear resistance of 200 lbf/in [34 kN/m] when tested in accordance with Test Method D624 with a nicked Die B.

4.2 Mechanical Devices—Expansion rings, tension bands, and take-up devices used for mechanically compressing the resilient portion of the connector against the pipe, manhole or structure shall be made from a material or materials in combination that will ensure durability, strength, resistance to corrosion, and have properties that will ensure continued resistance to leakage. All metallic mechanical devices, including castings and bolt assemblies used to mechanically deform resilient materials shall be constructed of corrosion resistant materials meeting the physical properties and chemical composition requirements of Type 300 series within Specifications A493 and A666.

NOTE 3—Experience has shown that successful performance of this product depends on the type of bedding and backfill and the care in the field installation of the manhole or structure and connecting pipes. The owner is cautioned to require inspection at the construction site.

5. Principles of Design

5.1 The design of the connector shall be such that positive seal is accomplished at two locations: *(1)* between the connector and the wall of the manhole or structure and *(2)* between the connector and the pipe.

5.1.1 The seal between the connector and the wall of the manhole or structure shall be made by either mechanical means, compression of the resilient material between the outside surface of the pipe and the pipe opening in the wall of the manhole or structure, or by casting the connector integrally with the wall of the manhole or structure.

5.1.2 The seal between the connector and the pipe shall be made by mechanical means or by compression of the resilient material against the outside of the pipe.

5.1.3 Due to the corrugated outer wall of the pipe, resilient filler rings are not prohibited from being used between the pipe and the connector to provide a seal.

5.2 The connector shall be capable of maintaining a resilient, hydrostatic seal under the performance conditions in Section 7. Devices used to effect mechanical seals shall conform to the requirements specified in Section 4.

5.3 If so fabricated, all pipe stubs installed to allow for future connection to the manhole or structure shall be mechanically restrained from movement by means of, and in addition to, the resilient connectors. Movement of these optional stubs will affect the results of the test

6. Basis of Acceptance

6.1 For diameter 36 in. [900 mm] and smaller, at least one connector shall be tested for each 6 in. [150 mm] increment in diameter. For diameters larger than 36 in. [900 mm], at least one connector shall be tested for each 12 in. [300 mm] increment in diameter.

6.2 The acceptability of the resilient connector shall be determined by the results of the physical tests prescribed in this specification, if and where required, and by inspection, to determine whether the connector conforms to the specification with regards to design and freedom from defects

6.3 When requested, a current certification shall be furnished as the basis of acceptance. The certification shall consist of the connector manufacturer's test report, or statement by the manufacturer, accompanied by a copy of the test results, that the resilient connector has been tested and inspected in accordance with the provisions of Section 4 and Section 7. Each certification so furnished shall be signed by the connector manufacturer or an authorized agent, such as an independent professional engineer, who has witnessed the testing.

NOTE 4—Certification shall be deemed current, if it represents present design, and bears a date that is no more than five years older than the current date.

7. Test Methods and Requirements

7.1 Install a pipe(s) and the resilient connector(s) to be tested in the base section of a manhole or structure per the pipe and connector manufacturers' recommendations. Subject the assembly to the prescribed hydrostatic pressure in 7.2 at the centerline of the connector for a period of 10 min. for each test condition. Restrain the pipe against axial movement during the tests.

NOTE 5—The user of this specification is advised that all safety requirements and procedures should be reviewed prior to the test.

7.2 There shall be no leakage under any of the following conditions:

7.2.1 Straight alignment of the pipe(s) subjected to a hydrostatic pressure of 10.8 psi [74 kPa] for 10 min.

7.2.2 Axial misalignment of the pipe(s). Upon completion of the test in 7.2.1 the pipe(s) shall be adjusted to provide a minimum angular misalignment of 7° in any direction from the

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