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Standard Specification for Storm Drain Resilient Connectors Between Reinforced Concrete Storm Sewer Structures, Pipes, and Laterals[1]

This standard is issued under the fixed designation C1478; 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 minimum performance and material requirements for resilient connectors used for connections between precast reinforced concrete storm sewer structures conforming to Specification C478 and pipes, and between precast reinforced concrete pipe and laterals for storm drainage systems.

1.1.1 These connectors are designed to prevent soil migration between the pipe and storm sewer structure, and between the pipe and lateral.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are for information only.

NOTE 1—This specification covers the design, material, and performance of the resilient connection only. Connections covered by this specification are adequate for hydrostatic pressures up to 6 psi (14 ft) without leakage when tested in accordance with Section 7. Infiltration quantities for an installed system are dependent upon many factors other than the connections between storm sewer structures and pipe, and allowable quantities must be covered by other specifications and suitable testing of the installed pipeline and system.

1.3 The following precautionary caveat pertains only to the test methods portion, Section 7, of this specification: *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 warning statement, see 7.2.4.

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

D395 Test Methods for Rubber Property—Compression Set

D412 Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension

D471 Test Method for Rubber Property—Effect of Liquids

D543 Practices for Evaluating the Resistance of Plastics to Chemical Reagents

D573 Test Method for Rubber—Deterioration in an Air Oven

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

D883 Terminology Relating to Plastics

D1149 Test Methods for Rubber Deterioration—Cracking in an Ozone Controlled Environment

D1566 Terminology Relating to Rubber

D2137 Test Methods for Rubber Property—Brittleness Point of Flexible Polymers and Coated Fabrics

D2240 Test Method for Rubber Property—Durometer Hardness

NOTE 2—For more information about wastewater structures, see Specification C913.

3. Terminology

3.1 *Definitions:*

3.1.1 Terms relating to plastics and rubber shall be as defined in Terminologies D883 and D1566, respectively.

3.1.2 Terms relating to precast concrete pipe, manholes, and related products shall be as defined in Terminology C822.

3.2 *Definitions of Terms Specific to This Standard:*

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

3.2.2 *lateral*—the small diameter pipe connected to the main line pipe.

[1] This specification is under the jurisdiction of ASTM Committee C13 on Concrete Pipe and is the direct responsibility of Subcommittee C13.06 on Manholes and Specials.

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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.

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

3.2.4 *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 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 Table 1. If a splice is used in the manufacture of the seal, its strength shall be such that the seal shall withstand a 180° bend with no visible separation.

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 or storm sewer 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 Specification A493 and A666, Type 302 through Type 316.

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 storm sewer 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 storm sewer structure wall and (*2*) between the connector and the pipe. The seal between the connector and the storm sewer structure wall may be made by either mechanical means, compression of the resilient material between the outside surface of the pipe and the pipe opening in the storm sewer structure wall, or by casting the connector integrally with the storm sewer structure wall. The seal between the connector and the pipe may be made by mechanical means or by compression of the resilient material against the outside of the pipe. Resilient filler rings may be used between the pipe and the connector to provide a seal. Whichever design is used, it shall be capable of maintaining a resilient, hydrostatic seal under the performance conditions in accordance with Section 7. Devices used to effect mechanical seals shall conform to the requirements specified in Section 4.

5.2 For lateral to pipe connectors, the design of the connector shall be such that a positive seal is accomplished at two locations: (*1*) between the connector and the pipe wall and (*2*) between the connector and the lateral. The seal between the connector and the pipe wall may be made by either mechanical means, compression, or by casting the connector integrally with the pipe wall. The seal between the connector and the lateral may be made by either mechanical means or by compression of the resilient material against the outside of the pipe. Resilient filler rings may be used between the lateral and the connector to provide a seal. Connector design must not allow either lateral or connector to extend past the cylindrical plane of the pipe inside diameter. The connector shall be capable of maintaining a resilient hydrostatic seal under the performance conditions in accordance with Section 7. Devices used to effect mechanical seals shall conform to the requirements specified in Section 4.

5.3 *Pipe Stubs*—Owners shall require that all pipe stubs installed to allow for future connections to storm sewer structures be mechanically restrained from movement by means other than, and in addition to, the resilient connectors.

6. Basis of Acceptance

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

TABLE 1 Resilient Material Tests

Test	Test Requirements[A]	ASTM Test Method
Chemical resistance:		D543, at 22°C for 48 h
1 *N* sulfuric acid	no weight loss	
1 *N* hydrochloric acid	no weight loss	
Tensile strength	1200 psi, min	D412
Elongation at break	350 %, min	
Hardness[B]	± 5 from the connector manufacturer's specified hardness	D2240 (Shore A Durometer)
Accelerated oven-aging	decrease of 15 %, max, of original tensile strength decrease of 20 %, max, of elongation	D573, 70± 1°C for 7 days
Compression set	decrease of 25 %, max, of original deflection	D395, Method B, at 70°C for 22 h
Water absorption	increase of 10 %, max, of original by weight	D471, immerse 0.75 by 2-in. specimen in distilled water at 70°C for 48 h
Ozone resistance	rating 0	D1149
Low-temperature brittle point	no fracture at– 40°C	D2137
Tear resistance	200 lbf/in.	D624, Die B

[A] Specimens shall be prepared from connector specimens and shall not be prepared from laboratory slabs or by direct molding.
[B] The connector manufacturer shall select the hardness appropriate for each component of the connector. Thereafter, the hardness shall comply within the tolerances in Table 1.