This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

Designation: F2946 – 12 (Reapproved 2021)

An American National Standard

Standard Specification for PVC Hub and Elastomeric Seal (Gasket) Tee Connection for Joining Plastic Pipe to Insitu Pipelines and Manholes[1]

This standard is issued under the fixed designation F2946; 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 a three piece tee connector for connection between plastic pipe and insitu pipes, manholes and wastewater structures in sanitary and storm sewer applications.

1.1.1 The three piece seal system consists of a 4 through 30-in. PVC (polyvinyl chloride) hub pipe, an elastomeric seal (gasket) and a mechanical band (Fig. 1). The system is installed in either a bored or cast hole opening in the host pipe or structure to a specific dimension that corresponds to the combined diameter of the PVC pipe outside diameter/tolerance and the elastomeric seal thickness.

1.2 These tee connectors are designed to provide a non-pressure (gravity flow) watertight connection between the incoming pipe and an insitu pipe or manhole/structure to the limits defined in this standard.

NOTE 1—Connections covered by this specification are adequate for laboratory hydrostatic pressures up to 13 psi (30 ft of head) without leakage when tested in accordance with the provisions of this standard. Infiltration or exfiltration quantities for an installed system are dependent upon many factors other than the connections between incoming pipe and the insitu pipe or manhole structure, and allowable quantities may need to be covered by other specifications and suitable testing of the installed pipeline and system. Where connections are made to concrete manhole sections refer to Specification C923.

NOTE 2—These connectors are not resilient connectors, and as such, allow for only a limited amount of lateral movement due to the tight compression seal between the PVC hub and insitu pipe/structure. Since these connectors are not rigid fittings, a significant amount of axial movement can be accommodated, but the degree of intrusion into the host pipe/structure must be regulated to minimize the impact on flow characteristics or hydraulic design conditions.

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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.* For a specific precaution statement, see Section 7.

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

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

C822 Terminology Relating to Concrete Pipe and Related Products

C923 Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals (Metric) C0923_C0923M

D1566 Terminology Relating to Rubber

D1785 Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120

D2665 Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings

D3034 Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings

F412 Terminology Relating to Plastic Piping Systems

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

F679 Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings

F1417 Practice for Installation Acceptance of Plastic Non-pressure Sewer Lines Using Low-Pressure Air

F2487 Practice for Infiltration and Exfiltration Acceptance Testing of Installed Corrugated High Density Polyethylene and Polypropylene Pipelines

[1] This test method 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.

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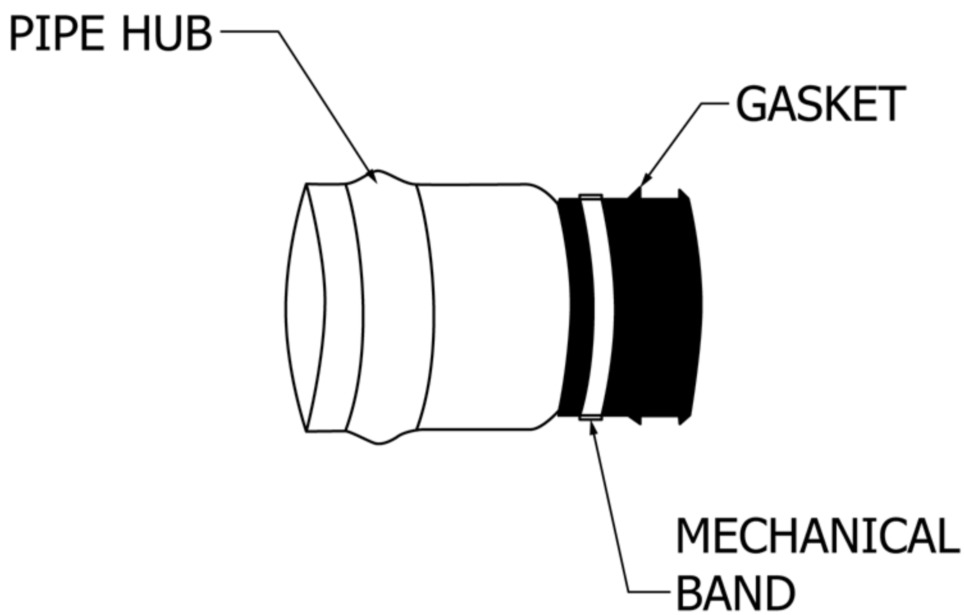

FIG. 1 Three-Piece Sealing System (Connector)

2.2 *AWWA Standard:*[3]

C900 Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 in. Through 12 in. (100 mm Through 300 mm), for Water Transmission and Distribution

3. Terminology

3.1 *Definitions:*

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 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, n*—the entire assembly including pipe hub, elastomeric seal and mechanical band.

3.2.2 *insitu, adj*—reflects the condition of the pipe, manhole or waste water structure that serves as the host to the connector. These facilities are existing structures that has been excavated for the purposes of tapping or connecting into the line.

3.2.3 *mechanical band, n*—metallic or nonmetallic mechanical device used for compressing an elastomeric seal against a pipe's outside diameter wall, typically a stainless steel worm screw clamp.

3.2.4 *pipe hub, n*—a short section of pipe used to made a watertight connection to the incoming pipeline. This pipe hub is typically made from the same pipe material and meeting the same ASTM standard as the incoming pipeline.

4. Materials and Manufacture

4.1 All materials shall conform to the following requirements:

4.1.1 *Elastomeric Seals*—Gasket materials for connectors shall meet the requirements of F477.

4.2 *Mechanical Device or Band*—Take-up devices used for mechanically compressing the resilient portion of the connector against the pipe, manhole or wastewater 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 elastomeric seals shall be constructed of corrosion resistant materials meeting the physical properties and chemical composition requirements of Specifications A493 and A666, Type 302 through Type 316. The minimum torque requirement for securing the band around the PVC hub shall be 60 in-lbs.

4.3 *PVC Hubs*—PVC pipe and joint sections that constitute the hub component of this system shall be fabricated from pipe and joint that meet the requirements of either Specification D1785, D2665, D3034, F679 or AWWA C900.

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 wastewater structure and connecting pipes. The owner is cautioned that field inspection at the construction site may be necessary.

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 elastomeric seal and the wall of the insitu pipe, manhole or wastewater structure and *(2)* between the elastomeric seal and the pipe hub. The watertight seal between the insitu pipe, manhole or waste water structure is made by the compression of the gasket between the insitu structure and the pipe hub.

5.1.1 The seal between the connector and the wall of the insitu pipe, manhole or wastewater structure shall be made by mechanical means, compression of the elastomeric seal between the outside surface of the pipe hub and the opening in the wall of the insitu pipe, manhole or wastewater structure.

[3] Available from American Water Works Association (AWWA), 6666 W. Quincy Ave., Denver, CO 80235, http://www.awwa.org.

iTeh Standards (https://standards.iteh.ai) Document Preview ASTM F2946-12(2021) https://standards.iteh.ai/catalog/standards/sist/...-4129-429c-...astm-f2946-122021

5.1.2 The seal between the connector and the pipe hub shall be made by mechanical means by compression of the elastomeric material against the outside of the pipe hub with a mechanical devise or band. Devices used to effect mechanical seals shall conform to the requirements specified in Section 4.

5.2 All pipe stubs installed shall allow for future connection to the insitu pipe, manhole or wastewater structure, and be mechanically restrained from movement by means of the elastomeric connectors. If an internal and external lip or seal is made with the insitu pipe, manhole or waste water structure with the elastomeric seal, this seal shall not extend more than 0.25 in. (6.25 mm) into the flow channel or void area of the insitu structure.

6. Basis of Acceptance

6.1 *Laboratory Testing:*

6.1.1 For each connector diameter, type and configuration at least one connector shall be laboratory tested per year in accordance with the procedures in Section 7. Tests shall be conducted on each combination of size, connector, pipe material, and pipe/structure.

6.1.2 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.

6.1.3 When requested, a current certification shall be furnished as the basis of acceptance. The certification shall consist of third party test report, accompanied by a copy of the test results, that the 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.

6.1.4 Certification shall be deemed current, if it represents present design, and bears a date that is no more than one year older than the current date.

6.2 *Tee Bending Test:*

6.2.1 *Tees*—The tee connector shall be subjected to a load as illustrated in Fig. 2. The load shall result in a minimum bending moment of 100 ft·lbf (136 Nm). The procedure may be modified providing the resultant bending moment is maintained.

NOTE 4—The tee bending test is intended to insure the connector when installed in the insitu pipe/structure has adequate strength to prevent dislodging during installation and construction. It is not intended to validate the structural capacity of the either the connector or host structure.

6.3 *Field Testing:*

6.3.1 When required in the project documents, field air tests of connectors placed into insitu pipelines shall be conducted according the requirements of Specification F1417. Only the connector needs to be evaluated, the incoming lateral pipe, which adjoins the connector, or the insitu pipe does not need to constitute part of this test.

NOTE 5—When field pressure testing joint connections, extreme care needs to be taken to insure all bulkheads and plugs are properly secured and braced to prevent movement. This standard does not address all the field related procedures necessary to conduct a safe test.

6.3.2 In lieu of the requirements in section 6.3.1, if the pipe used in the insitu pipeline is within the scope of Specification F2487, it is permitted to evaluate the performance and acceptance of the connector as part of the infiltration and exfiltration test of the pipeline in accordance with the requirements of Specification F2487. The performance of the pipeline shall, as a minimum, be 200 gal/in/day (18.5 L/mm of internal diameter) or the project requirements, whichever is more severe or has the higher requirement.

NOTE 6—Field performance depends greatly on the accuracy of the field cored hole in the host pipe, and the relative condition of the host pipe with regards to its overall deformation and deflection.

7. Test Methods and Requirements

7.1 Install a pipe(s) and the connector(s) to be tested in the base section of a pipe, manhole or wastewater structure. 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.

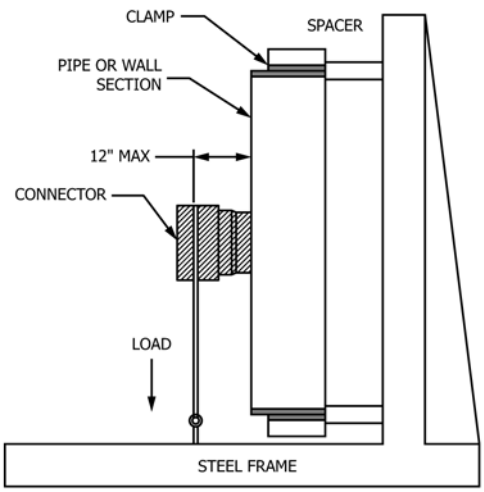

FIG. 2 Tee Bending Test (Schematic Representation)