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Standard Specification for Flexible Transition Couplings for Underground Piping Systems¹

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1. Scope

1.1 These specifications describe the properties of devices or assemblies suitable for use as flexible transition couplings, hereinafter referred to as couplings, for underground drainage and sewer piping systems.

1.2 Couplings that may include bushings or inserts and that meet the requirements of this standard are suitable for joining plain end pipe or fittings. The pipe to be joined shall be of similar or dissimilar materials, size, or both.

1.3 The values stated in inch-pound units shall be regarded as standard.

1.4 The ASTM standards referenced herein shall be considered mandatory.

1.5 The committee with jurisdiction over this standard is not aware of another comparable standard for materials covered in this standard.

2. Referenced Documents

2.1 ASTM Standards:²

C 717 Terminology of Building Seals and Sealants

D 412 Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension

D 471 Test Method for Rubber Property—Effect of Liquids

D 518 Test Method for Rubber Deterioration—Surface Cracking

D 543 Practices for Evaluating the Resistance of Plastics to Chemical Reagents

D 573 Test Method for Rubber—Deterioration in an Air Oven

D 638 Test Method for Tensile Properties of Plastics

D 1149 Test Method for Rubber Deterioration—Surface Ozone Cracking in a Chamber

D 2240 Test Method for Rubber Property—Durometer Hardness

¹ These specifications are under the jurisdiction of ASTM Committee A04 on Iron Castings and are the direct responsibility of Subcommittee A04.75 on Gaskets and Coupling for Plumbing and Sewer Piping.

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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.

D 3045 Practice for Heat Aging of Plastics Without Load

3. Terminology

3.1 *Definitions*—For definitions of terms used in this standard, see Terminology **C 717**.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *center stop*—an integral part of the gasket centered on its axial length intended to limit the insertion depth of the pipe to be coupled.

3.2.2 *fitting*—parts of a pipeline other than the straight pipe couplings, or valves.

3.2.3 *flexible transition couplings*—devices used to form a leakproof joint between sections of plain end pipe or fittings of the same or different materials, of the same or different size, or any combination of materials or pipe sizes.

3.2.4 *free torque*—the torque value expressed in lbf-in./Nm when the clamp is tightened four revolutions of the screw nut; while in the free state, this value does not include any breakaway effects due to staking or passage of the band ends beyond the screw heads.

3.2.5 *inserts*—a bushing or ring placed into the coupling socket to accommodate pipe materials of differing outside diameters.

3.2.6 *joint*—the completed assembly of parts consisting of the flexible transition coupling and the joined pipes, or fittings, or both.

3.2.7 *lot*—a specific quantity of similar material or collection of similar units from a common source; the quantity offered for inspection and acceptance at any one time. A lot might comprise a shipment, batch, or similar quantity.

3.2.8 *plain end pipe*—any pipe that does not include any bell, hub, threaded area, or other means of joining.

3.2.9 *shear ring*—an interior or exterior element which is used to span the distance between the pipe ends within a coupling so as to provide increased resistance to axial displacement.

4. Classification

4.1 The couplings shall be permitted to have a center stop. The components shall be designed so that the elastomeric material is compressed to form a hydrostatic seal when the joint is assembled. The couplings shall be of the types described in 4.1.1-4.1.3.

4.1.1 *Type A*—A coupling consisting of an elastomeric sleeve incorporating corrosion resistance tension bands and a tightening mechanism. Couplings shall be fabricated with or without shear rings, and with or without a center stop.

4.1.2 *Type B*—A coupling consisting of an elastomeric or rubber sleeve incorporating a corrosion resistant outer sleeve and tension bands, or tightening mechanism, or both (Note 1).

4.1.3 *Type C*—A coupling fabricated with elastomeric compression seals.

NOTE 1—The provisions of this standard are not intended to prevent the use of any alternate material or method of construction, provided any such alternate meets the requirements of this standard.

5. Materials and Manufacture

5.1 Elastomeric materials used in the manufacturing of couplings and inserts shall comply with the requirements set forth in Table 1.

5.2 Stainless steel tension bands shall be of the 300 series stainless steel.

5.3 Couplings or bushings/inserts, or both, of multi-piece construction or with splices shall show no separation, peeling, or other defects when tested in accordance with Section 9.

5.4 The coupling shall be free from porosity and air pockets. Its surface shall be smooth and free from pitting, cracks, blisters, air marks, or any other imperfections that affect its performance in service. The flash extension shall not exceed 1 mm at any point where the presence of flash affects performance.

6. Requirements

6.1 The physical and chemical properties of the coupling materials shall conform to the requirements specified in Table 1.

7. Dimensions

7.1 Couplings and bushing dimensions shall be compatible with the dimensions and tolerances of the specific material to which it is designed to join.

8. Sampling, Tests, and Retests

8.1 Test specimens representative of the couplings to be used shall be randomly selected from the manufactured lot for testing.

8.2 No less than two couplings for each size or type shall be tested, unless otherwise specified or waived by the purchaser.

8.3 Where there is a failure in the original test, the entire test shall be rerun with twice the number of samples and any failure shall be cause for rejection.

9. Test Methods

9.1 Elastomeric Materials:

9.1.1 *Hardness*—Hardness shall be measured on either a finished surface, a squarely cut end, or a flat sliced or buffed surface, depending on the size and shape of the specimen. See Test Method D 2240.

9.1.2 *Tensile Strength and Elongation*— The dumbbells shall be prepared from sections of the finished material. See Test Methods D 412.

9.1.3 *Heat Aging*, for hardness, tensile and elongation shall be performed in accordance with Test Method D 573. Specimens shall be oven-aged for 96 h at 158 ± 3.6°F (70 ± 2°C).

9.1.4 *Ozone Resistance*—Test specimens shall be used as described in Test Method D 518, Procedure A, stretched 20 % and exposed to an ozone concentration of 50 parts per 100 million for 100 h at 104 ± 3.6°F (40 ± 2°C). See Test Method D 1149.

9.1.5 *Water Absorption*—Size and time determinations shall be set in accordance with Test Method D 471. A specimen 0.075 by 1 by 2 in. (1.9 by 25 by 50 mm) shall be immersed in distilled water at 158 ± 3.6°F (70 ± 2°C) for 7 days. After seven days the specimen shall be removed, the surface moisture blotted and the specimen weighed. The percent gain shall be determined by the following equation:

$$\frac{(WF - WO)}{WO} \cdot 100$$

where:

WF = weight of specimen after immersion for 7 days, and

WO = dry weight of specimen before immersion.

9.1.6 *Chemical Resistance*—Samples shall be aged for 48 h at 74 ± 3.6°F (23 ± 2°C) using solutions of 1N sulfuric acid and 1N hydrochloric acid. See Test Method D 543.

9.2 Tension Band Performance:

9.2.1 *Torque Resistance*—Stainless steel tension bands shall be tested to withstand the manufacturers required torque or a minimum of 60 in.-lb (8.5 Nm) of applied torque without

TABLE 1 Test Requirements

Properties	Physical Requirements	ASTM Test Method
Elastomeric Materials		
Hardness, Nominal Shore "A" Durometer as specified by the coupling manufacturer	50–75	D 2240
Hardness, Nominal Shore "D" Durometer as specified by the coupling manufacturer	35–45	D 2240
Tensile strength, min psi (KPa)	1000 (6894)	D 412, Die C, Fig. 2 or D 638
Elongation at rupture, min, %	200	D 412, Die C, Fig. 2 or D 638
Heat aging, 70 h, 158 ± 3.6°F (70 ± 2°C)		D 573 or D 3045
Hardness increase, maximum Durometer points	10	
Change in tensile strength, max, %	25	
Change in elongation, max, %	35	
Ozone resistance	No cracks	D 1149
At 20 % elongation		
For 100 h at 104 ± 3.6°F (40 ± 2°C)		
With 50 parts per 100 million		
Water absorption, weight gain, %, max	20	D 471
Chemical resistance, 48 h, 74 ± 3.6°F (23 ± 2°C)	no weight loss	D 543
Stainless Steel Materials		
Torque resistance, 60 in.-lb (6.8 Nm)	no failure	9.2 of C1173
Manufacturers required torque resistance	no failure	9.2 of C1173
Joint Assemblies		
Deflection resistance 4.3 psi (30 kPa)	as given in Table 9.3.1 of C1173	2
Shear loading resistance (optional)	as given in Table 9.3.2 of C1173	3