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Standard Specification for Thermoplastic Elastomeric (TPE) Gasket Materials for Drain, Waste, and Vent (DWV), Sewer, Sanitary, and Storm Plumbing Systems[1]

This standard is issued under the fixed designation C1440; 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 thermoplastic elastomeric (TPE) gasket materials for preformed elastomeric gaskets used in shielded and non-shielded mechanical couplings. These couplings are used in gravity flow drain, waste, and vent (DWV), sewer, sanitary, and storm plumbing systems. They include couplings to join similar and dissimilar piping sizes and material.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.3 *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.*

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]

A644 Terminology Relating to Iron Castings
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
D573 Test Method for Rubber—Deterioration in an Air Oven
D624 Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers
D1149 Test Methods for Rubber Deterioration—Cracking in an Ozone Controlled Environment
D1415 Test Method for Rubber Property—International Hardness
D2240 Test Method for Rubber Property—Durometer Hardness
~~D5964 Practice for Rubber IRM 901, IRM 902, and IRM 903 Replacement Oils for ASTM No. 1, ASTM No. 2, ASTM No. 3 Oils, and IRM 905 formerly ASTM No. 5 Oil~~

[1] This specification is under the jurisdiction of ASTM Committee A04 on Iron Castings and is 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.

3. Terminology

3.1 *Definitions*—Refer to Terminology A644 for definitions of the following terms used in this specification: *elastomer, elastomeric, elongation, gasket, hardness, preformed gasket-(see gasket), thermoplastic elastomer*.

4. Materials and Manufacture

4.1 Gaskets shall be made of virgin thermoplastic elastomeric compound, where the primary elastomer is a thermoplastic vulcanizate containing only clean, reworked thermoplastic elastomer material from the manufacturer's own production of the same compound.

4.2 Where splices are made in the gasket, the strength of the splice shall be such that the gasket will withstand the stretch test described in 8.9 with no visible separation or peeling.

4.3 Many thermoplastic elastomeric materials (TPEs) are temperature sensitive. Designed operating temperature range for the 90 Shore A TPE materials is 0 to 130 °F (–18 to 55 °C). These materials are not designed or intended for prolonged operation outside this range.

5. Physical Properties

5.1 Gaskets representative of the manufacturer's production shall be selected as specified in Section 7 and shall conform to the requirements for physical properties listed in Table 1 when tested in accordance with the methods specified in Section 8.

6. Workmanship, Finish, and Appearance

6.1 The surface of the gasket shall be smooth and free of pitting, cracks, blisters, air marks, and any other imperfections that will affect its behavior in service. The body of the gasket shall be free of porosity and air pockets.

6.2 Neither the flash thickness nor the flash extension shall exceed 1/32 in. (0.8 mm), at any point on the ring.

6.3 The offset, or failure of the mold to register accurately, shall not exceed 1/64 in. (0.4 mm).

TABLE 1 Physical Requirements of Gasket Materials

Properties Tested	ASTM Test Method	TPE[A]
~~Hardness, Shore A (±5 pts)~~	~~D2240~~	~~90 (5 s Delay)~~
Hardness, Shore A (±5 pts)	D2240	90 (5 s delay)
Elongation, min, %	D412	250
Tensile Strength, min, psi (kPa)	D412	1500 (10 342)
Heat Aging	D573	
96 h at 158 ± 4 °F (70 ± 2 °C)		
Hardness increase, max, pts. Shore A		10
Loss in tensile strength, max, %		15
Loss in elongation, max, %		20
Tear Strength, min, lbf/in (N/cm)	D624	150 (268)
Water Absorption	D471	
7 days at 158 ± 4 °F (70 ± 2 °C)		
Weight increase, max, %		20
Ozone Resistance	D1149	No cracks
100 h at 104 ± 4 °F (40 ± 2 °C)		
~~Ozone Concentration 150 pphm~~		
Ozone Concentration 100 pphm		
20 % Extension		
Compression Set, max, %	D395	12
22 h at 158 ± 2 °F (70 ± 1 °C)	Method A	
Oil Immersion in IRM 903 Oil	D471	
70 h at 212 ± 4 °F (100 ± 2 °C)		
Max Volume Increase, %		80
Max Volume Decrease, %		15

[A] Designed operating temperature for Shore A TPE materials is 0 to 130 °F (–18 to 55 °C). These materials are not designed or intended for prolonged operation outside this range.

7. Sampling

7.1 For the stretch test specified in 8.9, sample gaskets shall be selected at random from each shipment of gaskets. For each of the other tests, gaskets shall be selected at random as required by the method of test specified.

8. Test Methods

8.1 *Hardness*—Test the gasket material for hardness in accordance with Test Method D2240. As required, use Test Method D1415 as the referee method. Make hardness measurements on specimens prepared in accordance with 8.2. However, hardness readings for guidance purposes shall be taken directly on the gasket, recognizing that these shall be permitted to vary slightly from those taken on the dumbbell specimens.

8.2 *Elongation and Tensile Strength*—Test the gasket material for elongation and tensile strength in accordance with Test Methods D412. Cut standard ASTM Type C dumbbell specimens conforming to Fig. 1 (Apparatus for Tensile Set Test) of Test Methods D412 from sections of the gasket for this test. To obtain a uniform thickness, these sections shall be permitted to be buffed prior to cutting into dumbbell specimens, so as to produce a finely ground surface without cuts or burns.

8.3 *Tear Strength*—Test the gasket material for tear strength in accordance with Test Method D624 using Die C.

8.4 *Compression Set*—Test the gasket material for compression set using Test Methods D395. Oven age samples for 22 h at 158 ± 2 °F (70 ± 1 °C). Test Method A shall be used, and there shall be a maximum dimensional change of 12 %. See Table 1.

8.5 *Heat Aging*—Test the gasket material for heat aging in accordance with Test Method D573. Prepare specimens in accordance with 8.2, and for 96 h at 158 ± 4 °F (70 ± 2 °C). Make hardness measurements as specified in 8.1.

8.6 *Water Absorption*—Test the gasket material for weight increase due to water absorption in accordance with Test Method D471. If a 1-in. (25.4-mm) specimen cannot be cut from the sample gasket, use the greatest width obtainable. Immerse the test specimen in distilled water at 158 ± 4 °F (70 ± 2 °C) for seven days.

8.7 *Ozone Resistance*—Test the gasket material for ozone resistance in accordance with Test Methods D1149, using specimens and procedure specified under Method B. The ozone concentration shall be ~~150~~100 pphm of air by volume. Age specimens 100 h at 104 ± 4 °F (40 ± 2 °C) with a 20 % extension. ~~Use a two-power hand magnification glass to examine the gasket.~~Gasket shall have no visible cracks at 2× magnification.

8.8 *Oil Immersion*—Test the gasket material for volume decrease due to oil absorption in accordance with Test Method D471. If a 1-in. (25.4-mm) specimen cannot be cut from the sample gasket, use the greatest width obtainable. The test specimen shall be immersed in IRM 903 oil for 70 h at 212 ± 4 °F (100 ± 2 °C).

8.9 *Stretch Test for Spliced Gaskets*—Stretch gaskets until the circumference is increased by 50 %, then visually inspect for defects as described in 4.2 and 6.1. One percent of the total spliced gaskets shall be tested with no failures.

9. Certification

9.1 When specified in the purchase order or contract, the purchaser shall be furnished certification stating samples representing each lot have been tested and inspected as indicated in this specification and the requirements have been met. When specified in the purchase order or contract, a report of the test results shall be furnished.

10. Marking

10.1 Each gasket shall be permanently marked with clearly legible letters. These markings shall include the gasket manufacturer's name or registered trademark, the pipe size and class, the country of origin, and the ASTM standard specification designation.