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An American National Standard

Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe[1]

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This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This specification covers elastomeric seals (gaskets) used to seal the joints of plastic pipe used for gravity, low-pressure, and high-pressure applications. This refers to push-on joints which require no internal or external pressure to effect the initial seal.

1.2 Requirements are given for natural or synthetic rubber gaskets, or a combination of both.

NOTE 1—Oil-resistant gaskets are available for those applications where exposure to solvents or oil may occur. The user should contact the gasket manufacturer for recommendations.

1.3 The text of this specification references notes, footnotes, and appendixes which provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of the specification.

1.4 The following precautionary caveat pertains only to the test method 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 consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:* [2]

D 395 Test Methods for Rubber Property—Compression Set

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 573 Test Method for Rubber—Deterioration in an Air Oven

D 883 Terminology Relating to Plastics

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

D 1229 Test Method for Rubber Property—Compression Set at Low Temperatures

D 1349 Practice for Rubber—Standard Temperatures for Testing

D 1414 Test Methods for Rubber O-Rings

D 1415 Test Method for Rubber Property—International Hardness

D 1566 Terminology Relating to Rubber

D 2240 Test Method for Rubber Property—Durometer Hardness

F 913 Specification for Thermoplastic Elastomeric Seals (Gaskets) for Joining Plastic Pipe

2.2 *NSF Standards:*

Standard No. 14 for Plastic Piping Components and Related Materials[3]

Standard No. 61 for Drinking Water Systems Components-Health Effects[3]

3. Terminology

3.1 *Definitions*—Terms relating to rubber or elastomer shall be as defined in Terminology D 1566. Terms relating to plastics shall be as defined in Terminology D 883.

4. Composition and Manufacture

4.1 All gaskets shall be extruded or molded in such a manner that any cross section will be dense, homogeneous, and free of porosity, blisters, pitting, or other imperfections. The gasket shall be fabricated from a high-grade elastomer material. The basic polymer shall be natural rubber, synthetic rubber, a blend of both, or a thermoplastic elastomer, meeting the requirements prescribed in Sections 5 and 6.

4.2 Where a splice is used in the manufacture of the gasket, the strength shall be such that the gasket shall withstand 100 % elongation over the part of the gasket which includes the splice with no visible separation of the splice. While in a stretched position the gasket shall be rotated in the spliced area a minimum of 180° in each direction in order to inspect for

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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 NSF International, P.O. Box 130140, 789 N. Dixboro Rd., Ann Arbor, MI 48113-0140, http://www.nsf.org.

separation. In addition, any portion of the splice shall be capable of passing a bend test without visible separation. The bend test for circular gaskets is defined as wrapping the portion of the unstretched gasket containing the splice a minimum of 180° and a maximum of 270° around a rod of a diameter equal to the cross section diameter of the gasket.

5. Dimensions and Tolerances

5.1 When in its final assembled position, the gasket shall not be stretched more than 30 % of its original circumference.

NOTE 2—Excessive stretch may have deleterious effect on rubber gaskets, the minimum stretch compatible with the proper performance of the gasket should be used at all times.

5.2 The gaskets shall conform to the dimensions specified by the manufacturer of the pipe or fittings, with which the gaskets are to be used, with a Rubber Manufacturers' Association Class 3 tolerance on all cross section dimensions, and ±1 % on all diametrical dimensions, unless otherwise agreed upon by the pipe or fitting manufacturer and the purchaser.

5.3 For molded gaskets or gasket material, the permissible flash shall be a maximum of +0.80 mm (0.032 in.). Maximum mold mismatch shall not exceed 0.25 mm (0.010 in.).

6. Physical Requirements

6.1 The sealing portion of the gaskets shall comply with the physical requirements listed in Table 1 for thermoset elastomers or Table 2 for thermoplastic elastomers, when tested in accordance with the methods in Section 7.

NOTE 3—Some gaskets incorporate a high durometer elastomeric or nonelastomeric, that is, metal or plastic material, as a reinforcement or retaining feature, or both. These materials do not alter the physical properties of the sealing portion of the gasket and should not be tested as such, or expected to meet the material requirements listed in Table 1.

NOTE 4—The gasket manufacturer should be assured that materials used for retaining or reinforcement, or both, do not encroach upon the sealing surfaces of the gasket, and have physical properties which ensure adequate longevity for the anticipated usage.

TABLE 1 Physical Requirements for Elastomeric Seals for Plastic Pipe

Tests	Low-Head Application (Below 150 kPa or 50-ft Head)	High-Head Application (150 kPa or 50-ft Head and Above)
Original Properties:		
Tensile strength, min, MPa (psi)	8.3 (1200)	13.8 (2000)[A]
Elongation, min, %	325	400
Hardness, Type A durometer	40 to 60	40 to 60
Low-temperature hardness, Type A durometer, max increase, points	15	15
Compression set, max %	25	20
Ozone resistance	no cracks	no cracks
Accelerated Aging (Air Oven Test):		
Decrease in tensile strength, max % of orignal	15	15
Decrease in elongation, max % of original	20	20
Hardness, Type A durometer, max increase, points	8	8
After Water Immersion:		
Change in volume max %	5	5

[A]For EPDM and nitrile seals, tensile strength min. MPa (psi) is 10.3 (1500).

TABLE 2 Physical Requirements for Thermoplastic Elastomeric Seals for Plastic Pipe

	Low-Head Application (Below 150 kPa or 50-ft Head)	High-Head Application (150 kPa or 50-ft Head and Above)
Original Properties:		
Tensile strength, min, MPa (psi)	3.0 (435)	3.5 (500)
100 % modulus, min, MPa (psi)	1.4 (200)	1.9 (280)
Elongation, min, %	350	350
Hardness, Type A durometer	40 to 70	40 to 70
Low-temperature hardness, Type A durometer, max increase, points	10	10
Compression set, max %	25	20
Ozone resistance	no cracks	no cracks
Accelerated Aging (Air Oven Test):		
Decrease in tensile strength, max % of original	15	15
Decrease in elongation, max % of original	15	15
Hardness, Type A durometer, max change, points	5	5
After Water Immersion:		
Change in volume max %	4	4
Force Decay	40	50
Remaining stress, min,%		

6.1.1 *Hardness*—The Type A durometer average hardness specified by the manufacturer shall be within the range given in Table 1 for thermoset elastomers or Table 2 for thermoplastic elastomers. Gaskets are required to have the Type A durometer hardness specified, ± 5 points.

6.2 Elastomer compounds must be non-crazing to pipe. The gasket in the cured state shall not cause craze marks, pits, or blisters when in contact with the plastic pipe. Staining of the plastic pipe in the area of gasket contact is acceptable. Test in accordance with 7.9 to qualify elastomer compound for pipe made from the plastic polymer in question.

6.3 Where the particular joint design utilizing a rubber gasket dictates the use of a lubricant to facilitate assembly, the lubricant shall be of such composition which will in no way damage the gasket or pipe due to prolonged exposure.

7. Test Methods

7.1 Perform laboratory tests to determine the physical properties of the gaskets to be furnished under this specification on: (*1*) the finished product as supplied, (*2*) test specimens taken from the finished product, or (*3*) from specimens of fabrication of the same elastomeric compound, and in accordance with the appropriate ASTM standard. (See Practice D 1349.)

7.2 *Tensile Strength and Elongation*—Determine tensile strength, 100 % modulus, and elongation in accordance with Test Methods D 412 or D 1414 for O-rings.

7.3 *Hardness*—Determine the durometer, Type A, of the gasket in accordance with Test Method D 2240 or Test Methods D 1414 for O-rings. (See Test Method D 1415.)

7.4 *Low-Temperature Hardness*—Measure the durometer, Type A, of the gasket in accordance with Test Method D 2240 or Test Methods D 1414 for O-rings after conditioning for 22 h at −10 ± 2°C (+14 ± 4°F) to determine the change in hardness.

7.5 *Compression Set*—Determine the compression set in accordance with Method B of Test Methods D 395 or D 1414 for O-rings. Test temperature and time shall be 22 h at 70 ±