



Standard Specification for Thermoplastic Elastomeric Seals (Gaskets) for Joining Plastic Pipe¹

This standard is issued under the fixed designation F 913; 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 seals (gaskets) used to seal the joints of plastic pipe and fittings used for gravity and low-pressure applications.² This specification refers to push-on joints that require no internal or external pressure to effect the initial seal.

1.2 Requirements are given for thermoplastic elastomers.

1.3

1.3 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.

1.4 The following precautionary caveat pertains only to the test methods portion, Section 8, 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.*

2. Referenced Documents

2.1 *ASTM Standards:*³

D 412 ~~Test Methods for Rubber Properties in Tension~~ Test Methods for Vulcanized Rubber and Thermoplastic Elastomers Tension

D 471 Test Method for Rubber Property—Effect of Liquids

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

D 1149 ~~Test Method for Rubber Deterioration—Surface Ozone Cracking in a Chamber (Flat Specimens)~~³ Test Methods for Rubber Deterioration Cracking in an Ozone Controlled Environment

D 1414 Test Methods for Rubber O-Rings

D 1566 Terminology Relating to Rubber;⁴

D 1600 Terminology for Abbreviated Terms Relating to Plastics (2008)

D 2240 ~~Test Method for Rubber Property—Durometer Hardness~~³ Test Method for Rubber Property Durometer Hardness

D 6147 ~~Test Method for Vulcanized Rubber and Thermoplastic Elastomer Determination of Force Decay (Stress Relaxation) in Compression~~

F 412 Terminology Relating to Plastic Piping Systems

F 118 Definitions of Terms Relating to Gaskets

3. Terminology

3.1 *Definitions*—are in accordance with Terminology F 412, and abbreviations are in accordance with Terminology D 1600, unless otherwise specified.

3.2 Terms relating to rubber or elastomer shall be as defined in Terminology D 1566 and Definitions F 118.

3.3 *Definitions of Terms Specific to This Standard:*

3.3.1 ~~gravity and low pressure applications~~—pressure below 50-ft head of water or 21 psi. gravity and low pressure applications, n—pressure below 150 kPa (21 psi) or (50-ft) head of water.

¹ This specification is under the jurisdiction of ASTM Committee F17 on Plastic Piping Systems and is the direct responsibility of Subcommittee F17.20 on Joining. Current edition approved April 10, 2001. Published June 2001. Originally published as F913-86. Last previous edition F913-95.

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² Supporting data are available at ASTM Headquarters. Request RR:F17-1035.

³ Supporting data have been filed at ASTM International Headquarters and may be obtained by requesting Research Report RR: F17-1035.

⁴ 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*, Vol 09.01, volume information, refer to the standard's Document Summary page on the ASTM website.

4. Materials and Manufacture

4.1 The gasket shall be fabricated from a high-grade thermoplastic elastomer meeting the requirements in Table 1.

~~4.2 The gasket shall meet the stress relaxation requirements of~~

4.2 The gasket shall meet the force decay (stress relaxation) requirements of 5.1.3.

4.3 The thermoplastic elastomer used must be noncrazing to pipe. The gasket shall not cause craze marks, pits, or blisters in contact with the plastic pipe. Staining of the plastic pipe in the area of gasket contact is acceptable. Test in accordance with 8.8 to qualify thermoplastic elastomers for pipe made from the plastic polymer in question.

4.4 Where the particular joint design utilizing a TPEL gasket dictates the use of lubricant to facilitate assembly, the lubricant shall be of such composition that will in no way damage the gasket or pipe due to prolonged exposure and shall not adversely affect the sealing capability of the gasket.

NOTE 1—By agreement between the purchaser and the manufacturer, chemical analysis may be required and limits established for elements or compounds not specified.

5. Physical Requirements

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5.1 The sealing portion of the gasket shall comply with the physical requirements listed in Table 1 when tested in accordance with the methods in Section 8.

NOTE 2—Some gasket incorporated 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 3—The materials used for retaining or reinforcement, or both, should not encroach upon the sealing surfaces of the gasket, and have physical properties which are adequate for the anticipated usage of the gasket.

5.1.1 *Hardness*—A variation of ± 5 points of Type A durometer from the manufacturer’s specified hardness shall be allowed when tested in accordance with 8.3.

5.1.2 Elongation for the harder portion of multi-durometer gaskets shall not be less than 100 %. The elongation for the softer portion of the gasket shall meet the requirements of Table 1.

5.1.3 *Stress Relaxation*—Using the procedure in 8.9, the 100000-h extrapolation of stress remaining shall be a minimum of 40% of the initial stress which must be 500 to 1400 kPa. Testing shall be done at $23 \pm 2^\circ\text{C}$ for a minimum of 1000 h. Force Decay (Stress Relaxation)—Using the procedure in D 6147, the remaining stress shall be a minimum of 40 % of the initial stress. Testing shall be done at $70 \pm 2^\circ\text{C}$ ($158 \pm 4^\circ\text{F}$) for a minimum of 168 h. (Method B)

6. Dimensions, Mass, and Permissible Variations

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

TABLE 1 Physical Property Requirements for Seals Made from Thermoplastic Elastomers (TPEL)

Properties	Condition	Test Method	Minimum Requirements
Tensile strength	unaged after oven aging for 96 h at 70°C	D 412 ^A	2 MPa (300 psi) minimum maximum change of 15%
Elongation	unaged after oven aging for 96 h at 70°C	D 412 ^A	350 % minimum maximum change of 20 %
Hardness	unaged after oven aging for 96 h at 70°C	D 2240 ^A	40 durometer A minimum maximum change of 8 units
Low temperature hardness	type A or D durometer -10°C	D 2240 ^A	maximum increase of 15 units
Ozone resistance	70 h at 50 ppm ozone at 40°C at 20% extension	D 1149	No cracks
Ozone resistance	70 h at 50 pphm ozone at 40°C at 20 % extension	D 1149	No cracks
Water immersion Stress relaxation	after 48 h at 70°C	D 471 ^A	5 % maximum change in volume —initial stress —100 000 h extrapolation of % stress remaining
Force Decay	after 168 h at 70°C	D 6147	—initial stress —100 000 h extrapolation of % stress remaining

^A For O-rings refer to Test Method D 1414.

[†] Editorially revised in September 2006.