



Standard Specification for Dense Elastomeric Silicone Rubber Gaskets and Accessories¹

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1. Scope

1.1 This specification describes products composed of dense elastomeric silicone rubber that are fabricated into gaskets and accessories (such as setting blocks, spacers, and shims) for use in sealing and glazing applications in building construction. These products are used to seal or serve as components of compression sealing systems between mechanically restrained surfaces in building construction and also as components in structural silicone sealant glazing systems.

1.2 The values stated in metric (SI) units are to be regarded as the standard. The inch-pound values given in parentheses are provided for information purposes only.

1.3 Test Method C 1166, as referenced in this specification, should be used to measure and describe the properties of materials, products, or assemblies in response to heat and flame under controlled laboratory conditions and should not be used to describe or appraise the fire hazard or fire risk of materials, products, or assemblies under actual fire conditions. However, results of this test may be used as elements of a fire risk assessment that takes into account all of the factors which are pertinent to an assessment of the fire hazard of a particular end use.

1.4 The following precautionary statement pertains only to the test method portion, Section 10, 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:

- C 717 Terminology of Building Seals and Sealants²
- C 1087 Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems²
- C 1166 Test Method for Flame Propagation of Dense and Cellular Elastomeric Gaskets and Accessories²

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² *Annual Book of ASTM Standards*, Vol 04.07.

D 395 Test Methods for Rubber Property—Compression Set³

D 412 Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers—Tension³

D 573 Test Method for Rubber—Deterioration in an Air Oven³

D 624 Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers³

D 792 Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement⁴

D 925 Test Methods for Rubber Property—Staining of Surfaces (Contact, Migration, and Diffusion)³

D 1149 Test Method for Rubber Deterioration—Surface Ozone Cracking in a Chamber³

D 1566 Terminology Relating to Rubber³

D 2137 Test Methods for Rubber Property—Brittleness Point of Flexible Polymers and Coated Fabrics³

D 2240 Test Method for Rubber Property—Durometer Hardness³

D 3182 Practice for Rubber—Materials, Equipment, and Procedures for Mixing Standard Compounds and Preparing Standard Vulcanized Sheets³

2.2 *Rubber Manufacturers Association (RMA) Standard: Rubber Handbook*, Fourth Ed., December 1984⁵

2.3 *Other Documents:*

Uniform Freight Classification Rules⁶

National Motor Freight Classification Rules⁷

3. Terminology

3.1 Refer to Terminology C 717 for definitions of the following terms used in this specification: compound, compression gasket, edge spacer, elastomer, elastomeric, expansion gasket, gasket, hardness, seal, setting block, shim spacer, and spacer.

3.2 Refer to Terminology D 1566 for definitions of the following terms used in this specification: compression set,

³ *Annual Book of ASTM Standards*, Vol 09.01.

⁴ *Annual Book of ASTM Standards*, Vol 08.01.

⁵ Available from the Rubber Manufacturers Association, 1400 K St., NW, Washington, DC 20005.

⁶ Available from Western Railroad Assn, Department of Services and Supply, Room 1150, 222 S. Riverside Plaza, Chicago, IL 60606-5945.

⁷ Available from National Motor Freight Assn, 2200 Mill Road, Alexandria, VA 22314.

ultimate elongation, tear strength, tensile strength, and polymer.

4. Classification

4.1 The products described by this specification are classified by type, hardness, class, and surface.

4.2 Type:

4.2.1 *Type T, Tear Resistant*—In general these products have a higher level of tear resistance, midrange heat aging characteristics, midrange compression set resistance, and 30 to 70 durometer hardness. This type is applicable where finished products are intended to bridge or to cover a space (for example, expansion joint gaskets), or where high tear strength is required due to conditions of exposure or usage.

4.2.2 *Type C, Compression Set Resistant*—In general, these products have a lower level of tear resistance, above midrange heat aging characteristics, a high level of compression set resistance, and 30 to 85 durometer hardness. This type is applicable where finished products are used as compression gaskets, or where low compression set is required due to conditions of exposure or usage; and as settingblocks, spacers, shims, or other accessories in glazing and sealing systems.

4.3 *Hardness*—Each type described in 4.2 is subdivided into various hardnesses, based on nominal durometer hardness as shown in Table 1 and Table 2. For example, Grade H3 is 30 durometer.

4.4 Class:

4.4.1 Flame propagation characteristics of the finished products can be varied depending on the degree of exposure, expected usage, and intended durability desired. Products described by this specification shall be classified as to flame propagation as follows:

4.4.1.1 *Class F*—Resistance to flame propagation is required.

4.4.1.2 When no flame propagation resistance is required, no class designation should be used.

4.5 Surface:

4.5.1 Consideration of product surface requirements may be necessary. During the production of these products the use of various lubricants, release agents, dusting agents, and other solutions may be required. It may be necessary after vulcanization to remove these materials from the surfaces of the product because of appearance, fabrication, or usage requirements. All products do not require removal of those materials or removal to the same degree of cleanliness.

4.5.2 Products may also be required to develop adhesion or to not develop adhesion to sealants with which they are in contact.

4.5.3 Products described by this specification shall be classified as to surface condition as follows:

4.5.3.1 *Surface S1*—The surface of the product shall be smooth, clean, free from any foreign matter, and shall not allow adhesion of sealants (see Note 1).

4.5.3.2 *Surface S2*—The surface of the product shall be smooth, clean, free from any foreign matter, and shall allow adhesion of sealants (see Note 1).

NOTE 1—Applied treatments, such as dusting or coating to the adhesion surface may be necessary to meet this requirement.

4.5.3.3 *Surface S3*—The product shall have a surface that is smooth, clean, and free from any foreign matter.

4.5.4 Products not requiring special cleaning for removal of processing agents and materials should not be assigned a surface designation code.

4.6 The following is an illustration of the use of the classification system for a line call-out. Expansion gaskets shall be ASTM C1115, TH5FS3.

Type	Hardness	Class	Surface
T	H5	F	S3

4.6.1 Other examples of line call-outs would be: edge spacers for structural silicone glazing shall be ASTM C 1115,

TABLE 1 Requirements for Dense Elastomeric Silicone Rubber Gaskets and Accessories, Type T—Tear Resistant

Property	Hardness					Test Method
	3	4	5	6	7	
Low temperature flexibility	A	A	A	A	A	D 2137
Hardness, Type A durometer, ±5 points	30	40	50	60	70	D 2240
Compression set, max %	30	30	30	30	30	D 395
Tensile strength, min, MPa (psi)	7 (1015)	8 (1160)	8 (1160)	8 (1160)	7 (1015)	D 412
Ultimate elongation, min %	500	500	500	400	200	D 412
Heat aging						D 573
Hardness change, max durometer points	±10	±10	±10	±10	±10	
Tensile strength change, max %	±20	±20	±20	±20	±20	
Ultimate elongation change, max %	±30	±30	±30	±30	±30	
Ozone resistance	B	B	B	B	B	D 1149 (Specimen A)
Tear Strength, min, kN/m (ppi)	25 (143)	25 (143)	26 (149)	26 (149)	25 (143)	D 624
Flame propagation ^C , mm (in.)	100 (4)	100 (4)	100 (4)	100 (4)	100 (4)	C 1166
Specific gravity	D	D	D	D	D	D 792
Staining	E	E	E	E	E	D 925
Color	F	F	F	F	F	G

^ANo failure.

^BNo cracks at 7× magnification.

^CIf Class F-Resistance to flame propagation is required.

^DWithin ±0.05 of qualified compound.

^EAs specified by purchaser (see 10.11).

^FAs specified by purchaser.

^GSee 10.12.

TABLE 2 Requirements for Dense Elastomeric Silicone Rubber Gaskets and Accessories, Type C—Compression Set Resistant

Property	Hardness							Test Method
	3	4	5	6	7	8	9	
Low temperature flexibility	A	A	A	A	A	A	A	D 2137
Hardness, Type A durometer, ±5 points	30	40	50	60	70	80	85	D 2240
Compression set, max %	15	15	15	15	15	20	25	D 395
Tensile strength, min, MPa (psi)	5 (725)	5 (725)	5 (725)	5 (725)	5 (725)	5 (725)	5 (725)	D 412
Ultimate elongation, min, %	350	300	250	200	125	100	60	D 412
Heat aging								D 573
Hardness change, max, durometer points	±05	±05	±05	±05	±05	±05	±05	
Tensile strength change, max, %	±15	±15	±15	±15	±15	±15	±15	
Ultimate elongation change, max, %	±30	±30	±30	±30	±30	±30	±30	
Ozone resistance	B	B	B	B	B	B	B	D 1149 (Specimen A)
Tear strength, min, kN/m (ppi)	9 (51)	9 (51)	9 (51)	9 (51)	9 (51)	9 (51)	7 (40)	D 624
Flame propagation ^C , mm (in.)	100 (4)	100 (4)	100 (4)	100 (4)	100 (4)	100 (4)	100 (4)	C 1166
Specific gravity	^D	^D	^D	^D	^D	^D	^D	D 792
Staining	^E	^E	^E	^E	^E	^E	^E	D 925
Color	^F	^F	^F	^F	^F	^F	^F	^G

^ANo failure.

^BNo cracks at 7× magnification.

^CIf Class F-Resistance to flame propagation is required.

^DWithin ± 0.05 of qualified compound.

^EAs specified by purchaser, see 10.11.

^FAs specified by purchaser.

^GSee 10.12.

CH6S1; compression seal gaskets shall be ASTM C 1115, CH7S2; and setting blocks shall be ASTM C 1115, CH9. These examples are not to be construed as a specification for these items.

5. Materials and Manufacture

5.1 The silicone rubber shall be manufactured from virgin polymer, that when properly compounded and cured, will result in an elastomer that will comply with this specification.

5.2 The compound in its final shape shall be free of visible internal porosity, surface defects, and dimensional irregularities that affect serviceability and durability.

5.3 Unless otherwise specified, the compound color shall be black. If colors other than black are specified, the compound in the color specified shall also meet the requirements of this specification.

6. Dimensions and Permissible Variations

6.1 Dimensions can be affected by distortions induced by conditions of storage or shipping as well as temperature and humidity variations. Prior to measuring the product, it shall be unpacked and conditioned in an unstressed state for 24 h at 23 ± 2°C (73 ± 4°F) and 50 ± 5 % relative humidity.

6.2 Permissible variation in cross-sectional dimensions shall be as specified in Table 3 unless otherwise agreed upon between the purchaser and the supplier.

6.3 Tolerances for squareness and flatness are not included in this specification, due to the difficulty of establishing meaningful limits to satisfy a wide variety of applications. These tolerances should be as agreed upon between the supplier and purchaser.

7. Requirements

7.1 The physical, mechanical, and performance properties of the material shall conform to the requirements as described

TABLE 3 Standards for Cross-Sectional Tolerance

NOTE 1—Dimensional tolerances for outside diameters, inside diameters, wall thickness, width, height, and general cross-sectional dimensions of extrusions

Rubber Manufacturers Association ^A					
RMA Class		2 Precision	RMA Class		2 Precision
Drawing Designation		E2	Drawing Designation		E2
Dimensions (in inches)			Dimensions (in Millimeters)		
Above	Up To		Above	Up To	
0	0.06	±0.010	0	1.5	±0.25
0.06	0.10	0.014	1.5	2.5	0.35
0.10	0.16	0.016	2.5	4.0	0.40
0.16	0.25	0.020	4.0	6.3	0.50
0.25	0.39	0.027	6.3	10.0	0.70
0.39	0.63	0.031	10.0	16.0	0.80
0.63	0.98	0.039	16.0	25.0	1.00
0.98	1.57	0.051	25.0	40.0	1.30
1.57	2.48	0.063	40.0	63.0	1.60
2.48	3.94	0.079	63.0	100.0	2.00

^AAdapted from Rubber Manufacturers Association Handbook, Table 13, Fifth Ed., 1992

by Table 1 and Table 2.

8. Significance and Use

8.1 This specification describes types (based on resistance to tearing and compression set), grades (based on durometer hardness), class (based on flame propagation requirements), and surfaces (based on surface characteristics) of products as listed in Section 4 for various applications. It is essential, therefore, that the applicable type, grade, class, and surface be specified, as well as other options stated, so that the proper product is provided for the intended use.

9. Sampling

9.1 Samples for testing to the requirements of this specification shall be taken from the finished product wherever possible.

9.2 When the size or shape of the finished product makes it impossible to obtain the type of samples indicated by the various test methods, the manufacturer shall furnish a sufficient number of appropriate test slabs, strips or blocks, prepared in accordance with Recommended Practice D 3182. The slabs, strips, or blocks shall be prepared from the same compound and shall be of a comparable state of cure as the finished product.

10. Test Methods

10.1 *Low Temperature Flexibility*—Test Methods D 2137, Method A. All test specimens shall exhibit no failure at or above -40°C (-40°F). Dimethylpolysiloxane fluids shall not be used in the performance of this test method.

10.2 *Hardness*—Test Method D 2240, Type A Durometer. Depending on the size and shape of the product, measure hardness on a finished surface, a squarely cut end, or a sliced or buffed flat surface (see Note 2).

NOTE 2—Hardness readings for the purpose of approximate determinations may be taken from the dumbbell test specimens, recognizing that these readings may vary slightly from those taken from the finished product.

10.3 *Compression Set*—Test Methods D 395, Method B, Specimen Type 1. Oven age specimens for 22 h at $100 \pm 2^{\circ}\text{C}$ ($212 \pm 3.6^{\circ}\text{F}$). Where plied test specimens are necessary, the testing results shall comply with the requirements of Table 1 and Table 2.

10.4 *Tensile Strength*—Test Methods D 412, Test Method A, Die C.

10.5 *Ultimate Elongation*—Test Methods D 412, Test Method A, Die C.

10.6 *Heat Aging*—Test Method D 573, using 70 h at 150°C (320°F).

10.7 *Ozone Resistance*—Test Method D 1149, Specimen A, ozone concentration of 300 mPa with an exposure time of 100 h at $70 \pm 2^{\circ}\text{C}$ ($158 \pm 3.6^{\circ}\text{F}$).

10.8 *Tear Strength*—Test Method D 624, using Die B.

10.9 *Flame Propagation*—Test Method C 1166.

10.10 *Specific Gravity*—Test Methods D 792, Method A-1 or A-3. Determine the specific gravity of the compounds that comply with the requirements of these test methods, and include those values in the report of test results. Finished products complying with these test methods shall have specific gravities that conform to the requirements of Table 1 and Table 2.

10.11 *Staining*—Test Methods D 925, Test Methods A and B. The finished surface against which stain is to be tested and the acceptable degree of staining shall be specified by the purchaser.

NOTE 3—Gaskets and accessories used as components in structural silicone sealant glazing systems require testing to different requirements for staining or color change of the sealant, caused by the gasket or accessories. Refer to Test Method C 1087.

10.12 *Color*—The color of the finished product, after completion of the tests in 10.1, 10.6, and 10.7, shall be the color which has been agreed upon between the purchaser and the supplier.

11. Certification

11.1 When specified in the purchase order or contract, the manufacturer's or supplier's certification shall be furnished to the purchaser stating that the finished products have been manufactured, tested, and inspected in accordance with this specification and the specified requirements have been met. When specified in the purchase order or contract, a report of the test results shall be furnished.

12. Product Marking

12.1 If required by the purchaser, each gasket or accessory shall be clearly and legibly marked, labeled, or tagged with the manufacturer's name, identifying part number, and other identification.

13. Product Packaging and Package Marking

13.1 Gaskets and accessories shall be properly packaged to avoid cuts, abrasions, permanent distortions, or other damage to them during shipping and storage. Each package or container shall be legibly and indelibly marked with the manufacturer's name and address, project name, identifying part number, quantity of parts in each container, and other identification required by the purchaser.

13.2 Gaskets and accessories shall be shipped in closed containers. Containers and packaging shall comply with the Uniform Freight Classification Rules or National Motor Freight Classification Rules. Containers shall not be handled in a manner that will cause damage to the contents.

13.3 Gaskets and accessories shall be stored in original containers in a clean dry area, free of dust, debris, oils, solvents, welding slag spatter or sparks, or other materials and conditions that may cause damage to the containers and the contents.

14. Keywords

14.1 compression; dense; elastomer; elastomeric; gasket; glazing; preformed; seal; setting block; silicone; spacers

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