Designation: C 509 – 00

Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Material[1]

This standard is issued under the fixed designation C 509; 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.

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

1. Scope

1.1 This specification applies to those elastomeric cellular materials of a firm grade that are manufactured in preformed shapes for use as gaskets and for use as sealing materials, in the form of compression seals or gaskets, or both, for glazing other building joint applications.

NOTE 1—For softer cellular elastomeric materials used in secondary sealing applications, refer to Specification D 1056.

1.2 *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 which takes into account all of the factors which are pertinent to an assessment of the fire hazard of a particular end use.*

1.3 The following precautionary caveat pertains only to the test method portion, Section 11, 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 Sealants[2]

C 1083 Test Method for Water Absorption of Cellular Elastomeric Gaskets and Sealing Materials[2]

C 1166 Test Method for Flame Propagation of Dense and Cellular Elastomeric Gaskets and Accessories[2]

D 395 Test Methods for Rubber Property—Compression Set[3]

D 412 Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers—Tension[3]

D 746 Test Method for Brittleness Temperature of Plastics and Elastomers by Impact[4]

D 865 Test Method for Rubber—Deterioration by Heating in Air (Test Tube Enclosure)[3]

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

D 1056 Specification for Flexible Cellular Materials—Sponge or Expanded Rubber[4]

D 1149 Test Method for Rubber Deterioration—Surface Ozone Cracking in Chamber[3]

3. Terminology

3.1 *Definitions*—Refer to Terminology C 717 for the following terms used in this specification: cellular material, elastomeric, gasket glazing, seal, and sealing material.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *compression seal*—a type of joint seal in which weathertightness is maintained by the exertion of compressive pressure on the gasket or sealing material.

3.2.2 *gasket glazing*—a method of setting glass or panels in prepared openings, using a preformed gasket to obtain a weathertight seal.

3.2.3 *preformed gasket*—an elastomeric compound molded in the form of a continuous strip, channel, or other shape, for use in filling joints and providing weathertight seals in glazing or between building components.

4. Materials and Manufacture

4.1 Elastomeric cellular materials furnished to this specification shall be manufactured from natural rubber, synthetic rubber, rubber-like materials, or mixtures of these, with added compounding ingredients of such nature and quality that, with proper curing, the finished product will comply with this specification.

4.2 The cured compounds shall be suitable for use where resistance to sunlight, weathering, oxidation, and permanent deformation under load are of prime importance.

4.3 The manufacturing process shall be such to ensure a

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

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

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

homogeneous cellular material free of defects that may affect serviceability.

4.4 Although under this specification the manufacturer is permitted to choose constituent materials, there is no implication that the several compounds are equivalent in all physical properties. Any special characteristics other than those required by this specification, which may be needed for specific applications, shall be specified by the purchaser, since such characteristics may influence the choice of base materials and other ingredients.

5. Physical Properties

5.1 The material shall conform to the requirements prescribed in Table 1.

6. Dimensional Tolerances

6.1 Permissible variation in cross-sectional dimensions shall be as specified in Table 2 unless otherwise agreed upon between the purchaser and the supplier.

7. Workmanship, Finish, and Appearance

7.1 The elastomeric cellular materials shall be manufactured and processed in a careful and workmanlike manner in accordance with the best commercial practices.

7.2 The surfaces of the finished material shall be reasonably smooth and free of excessive talc or bloom.

7.3 Unless otherwise specified, the material shall be black. When colored material is desired, it is recommended that other tests, agreed upon between the purchaser and the supplier, be conducted to ensure color stability.

8. Number of Tests and Retests

8.1 Any material that fails in one or more of the test requirements may be retested by making two additional tests for the requirements in which failure occurs. Failure in one such retest shall be cause for final rejection.

8.2 Rejected material shall be disposed of as directed by the supplier.

TABLE 2 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		1	RMA Class		1
Drawing Designation		BEC 1	Drawing Designation		BEC 1
Dimensions (in inches)			Dimensions (in Millimeters)		
Above	Up To		Above	Up To	
0	0.25	±0.016	0	6.3	±0.4
0.25	0.50	0.025	6.3	12.5	0.63
0.50	1.00	0.050	12.5	25.0	1.25
1.00	1.60	0.080	25.0	40.0	2.0
1.60 & over multiply by		0.060	40.0 & over multiply by		0.06

[A] Adapted from Rubber Manufacturers Association Handbook, Table 36, Fifth Ed., 1992

9. Significance and Use

9.1 *Flame Propagation*:

9.1.1 This specification has two options:

9.1.1.1 *Option I*—Flame propagation test is required.

9.1.1.2 *Option II*—Flame propagation test is not required.

9.1.2 In case no option is specified, Option I will apply.

9.2 This specification has two classifications as related to ozone resistance. These are Type I and Type II, with the latter having the greater resistance to ozone. The type should be specified when making reference to this specification but in the event that the type is not specified, Type II shall apply.

NOTE 2—Type II is included in this specification for use where greater ozone resistance is required.

10. Sampling

10.1 When possible, the completed manufactured product of a suitable section thereof shall be used for the tests specified. Representative samples of the lot being examined shall be selected at random as required.

10.2 When the finished product does not lend itself to testing or to the taking of test specimens because of complicated shape, small size, metal or fabric inserts, or other reasons,

TABLE 1 Physical Requirements of Cellular Elastomeric Materials

Property	Limit	ASTM Test Method[A]
Compression-deflection, 25 % deflection limits:		
kPa (psi)	91 to 168 (13 to 24)	D 1056
Compression set, 22 h @ 70°C (158°F) max, %	30	D 395, Method B
Heat aging[B], 70 h @ 100°C (212°F), change in compression-deflection values:		
kPa (psi)	0 to + 70 (0 to + 10)	D 865 and D1056
Dimensional stability, change, max %, after heat aging, 70 h @ 100°C (212°F)	4	11.4
Ozone resistance[C] at 40 % elongation, 100 h @ 40°C (104°F):		
Type I 100 mPa ozone	no cracks @ 7× magnification	D 1149
Type II 300 mPa ozone	no cracks @ 7× magnification	D 1149
Low-temperature brittleness @ − 40°C (−40°F)	pass	see Appendix X1
Water absorption, max, % weight	5.0	C 1083
Flame propagation:		
Option I	100 mm (4 in.) max.	C 1166
Option II	no limit	
Nonstaining[D]	no migratory stain	D 925

[A] See Section 11.

[B] After heat aging, surfaces of the specimen shall be neither hard nor brittle. A150-mm (6-in.) length of the finished extrusion shall exhibit no surface cracks when bent on itself 180°.

[C] The specimen shall exhibit no surface cracks when in the extended condition.

[D] This requirement may be waived, subject to agreement between the purchaser and the supplier.

standard test strips shall be prepared. The standard extruded specimens for testing, except where a specific specimen size is defined by a particular test method, shall be 6.4 mm (¼ in.) thick by 32 mm (1¼ in.) wide in rectangular cross section. The test pieces for flame propagation tests shall be as specified in 11.8. All test pieces shall be made from the same compound and shall have the same apparent density and state of cure as the product they represent.

10.3 The tests for dimensional stability, ozone resistance, water absorption, and nonstaining may be made on samples from the material to be shipped or on samples representative of it. Tests for compression deflection, compression set, heat aging, flame propagation, and low-temperature brittleness may be made on standard samples previously prepared in accordance with 10.2.

11. Test Methods

11.1 *Compression - Deflection* — Specification D 1056. Base calculations of compression-deflection on the original thickness of the specimens.

11.2 *Compression Set*—Test Methods D 395, Method B.

11.3 *Compression Deflection After Heat Aging*:

11.3.1 A 152-mm (6-in.) length of the finished extrusion shall be heat aged along with the specimen for Specification D 1056 and shall pass the requirements of Table 1, Footnote B.

11.3.2 Test for compression-deflection by first aging the specimen (a piece of appropriate size for the compression-deflection test, instead of the dumbbell-shaped tension specimen) in accordance with Test Method D 865, then measuring the compression-deflection value in accordance with Specification D 1056.

11.3.3 The specimen for heat aging shall be large enough to allow the taking of the appropriate number and six size of specimens as defined by Specification D 1056. The cutting of specimens for Specification D 1056 shall be done after the heat aging has been performed.

11.4 *Dimensional Stability After Heat Aging*—Determine the dimensional stability by subjecting a 150-mm (6-in.) length of the extruded shape to heat aging for 70 h at 100°C (212°F) in accordance with Test Method D 865. After aging, the changes in length and breadth dimensions of the specimen shall not exceed 4 %.

11.5 *Ozone Resistance*—Test Method D 1149. The concentration of ozone shall be 100 mPa for Type I and 300 mPa for Type II. The time of test shall be 100 h at 40±2°C (104±3.6°F) with a specimen as defined by 10.2 with a length of 152 mm (6 in.) and with a specimen elongation of 40 %.

11.6 *Low - Temperature Brittleness*—See Appendix X1.

11.7 *Water Absorption*—Use Test Method C 1083.

11.8 *Flame Propagation*—Test Method C 1166 determines whether or not the gasket will propagate flame, with no significance being attached to such matters as fuel contribution, rate of flame spread, smoke generation, or nature and temperature of products of combustion.

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

12. Inspection

12.1 All tests and inspections shall be made at the place of manufacture prior to shipment unless otherwise specified. The supplier shall provide the purchaser, without charge, all reasonable facilities to satisfy him that the material is being furnished in accordance with this specification.

13. Certification

13.1 When required, the supplier shall furnish the purchaser with a certified test report giving the results of the tests required to determine conformance with all requirements specified herein.

14. Packaging and Package Marking

14.1 All material shall be properly separated according to compound, size, etc., and shall be packaged and labeled in accordance with the best commercial practice with ample protection against damage in shipment.

15. Keywords

15.1 cellular; compression; elastomer; elastomeric; gasket; glazing; preformed; seal; sealing

APPENDIX

(Nonmandatory Information)

X1. TEST METHOD FOR LOW-TEMPERATURE BRITTLENESS OF RUBBER AND RUBBER-LIKE MATERIALS[5]

X1.1 Scope

X1.1.1 This test method is intended to determine the ability of compounds made from rubber or rubber-like materials to resist the effect of low temperatures that may cause them to become brittle and fracture or crack when bent. Standard specimens are exposed to specified low temperatures for definite periods after which the specimens are bent in a prescribed manner and any fracture or cracking noted. The procedure is commonly called the “Thiokol” method.

NOTE X1.1—Results obtained by this test method are influenced by the rate of flexing of the cooled specimens which can not be closely controlled in the prescribed apparatus. They are therefore of a qualitative nature and may not be closely reproducible over a range of several degrees of temperature depending on the speed of flexure. For more accurate determination of brittle temperature, and particularly in new specifications, Test Method D 746 is recommended.

[5] This test method was originally issued in 1943 under the designation D736 which was discontinued in April 1967.

X1.2 Apparatus

X1.2.1 *Cold Chamber*, of sufficient size to contain the flexing fixture when loaded with specimens, and so arranged as to permit the operation of the fixture to bend to specimens without removal from the chamber. It shall be capable of maintaining within it a uniform atmosphere of cold, dry air or a mixture of air and carbon dioxide at specified temperatures within a tolerance of ±1°C (2°F).

NOTE X1.2—Temperatures of −40°C (−40°F) and −55°C (67°F) are commonly used.

X1.2.2 *Flexing Fixture*, consisting of two parallel plates each having a width of at least 50 mm (2 in.) so supported in guides that they may be rapidly moved from a position 63 mm (2½ in.) apart until they are separated by a distance of 25 mm (1 in.). Suitable clamping bars or devices shall be provided for holding the ends of the specimens for a distance of 6.4 mm (¼ in.) at the corresponding edge of each plate so that when mounted, the specimens form similar bent loops between the plates. A satisfactory flexing fixture is shown in Fig. X1.1.

X1.3 Test Specimens

X1.3.1 The test specimens shall conform in shape to Die C as specified in Test Methods D 412 and shall have a thickness of 2.032 ± 0.254 mm (0.080 ± 0.010 in.).

X1.3.2 At least two specimens from each compound shall be tested.

X1.4 Procedure

X1.4.1 Mount the test specimens in loop position between the plates of the flexing fixture with the enlarged ends spaced at least 3.2 mm (⅛ in.) apart and held in the clamps for a distance of 6.4 mm (¼in.). With the plates in the open position separated 63 mm (2½ in.), place the fixture containing the specimens in the cold chamber and expose it for the specified period to cold, dry air or a mixture of air and carbon dioxide at the specified temperature. The standard exposure period shall be 5 h (Note X1.3). At the termination of the exposure period and while still in the cold chamber, move the plates of the flexing fixture as rapidly as possible from the 63-mm (2½-in.) distance of separation to a position where they are 25 mm (1 in.) apart. Then examine the specimens for fracture or visible cracks.

NOTE X1.3—Previously two periods were specified, 96 h for natural-rubber compounds and 5 h for synthetic-rubber compounds. It was found that 5 h is adequate for either class of compounds within the intent of this test method.

X1.5 Results

X1.5.1 When two specimens are tested and neither one fractures nor shows cracks after being tested, the compound shall be considered as having passed the brittleness test. If both specimens crack, the compound shall be considered to have failed.

X1.5.2 If only one specimen fractures or cracks, the result is inconclusive and two additional specimens shall be tested. If either one of these cracks, the compound shall then be considered to have failed.

X1.6 Report

X1.6.1 Report the following:

X1.6.1.1 The results of the test expressed as “passed” or “failed,”

X1.6.1.2 The temperature of the cold chamber,

X1.6.1.3 The duration of the exposure period,

X1.6.1.4 Identification of the material tested including description of any special treatment prior to test, and

X1.6.1.5 Data of manufacture of the material, if known, and date of test.

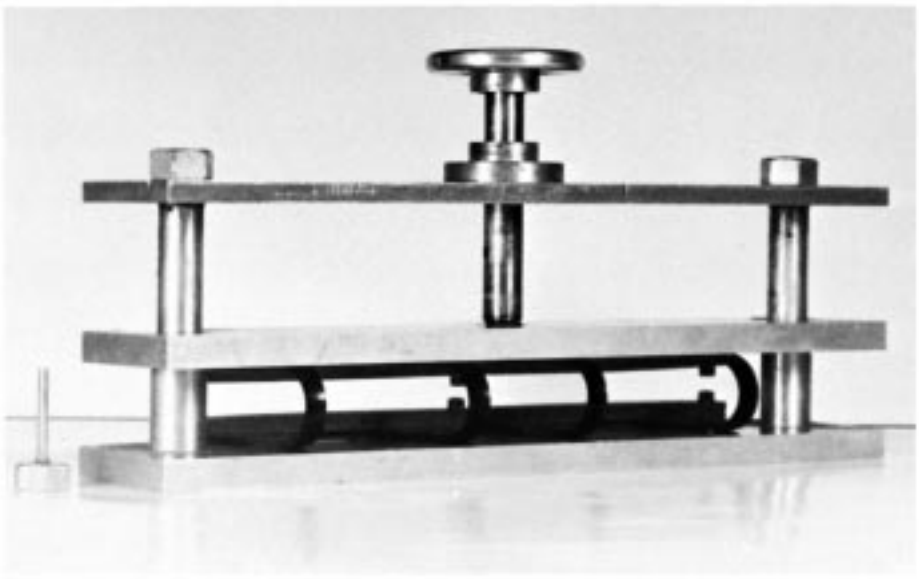

FIG. X1.1 Flexing Fixture for Low-Temperature Brittleness Test