Designation: D 1056 – 00

Standard Specification for Flexible Cellular Materials—Sponge or Expanded Rubber[1,2]

This standard is issued under the fixed designation D 1056; 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 to replace Methods 12001, 12005, 12011, 12021, 12031, 12041, 12151, and 12411 of Federal Test Method Standard No. 601.

This standard has been approved for use by agencies of the Department of Defense to replace MIL-STD-670 and MIL-STD-C 3133, which were discontinued in 1986.

1. Scope

1.1 This specification covers flexible cellular rubber products known as sponge rubber and expanded rubber, but does not apply to latex foam rubber or ebonite cellular rubber. The base material for an open/closed cellular product may be made of synthetic, natural, or reclaimed rubber, or a mixture, and may contain other polymers or chemicals, or both, which may be modified by organic or inorganic additives. These elastomeric materials have properties similar to those of vulcanized rubber, namely (1) the ability to be converted from a thermoplastic to a thermosetting state by crosslinking (vulcanization) or (2) the substantial recovery of their original shapes when strained or elongated, or both.

1.2 Extruded or molded shapes of sizes too small for cutting standard test specimens are difficult to classify or test by these methods and will usually require special testing procedures.

1.3 In case of conflict between the provisions of this general specification and those of detailed specifications or test methods for a particular product, the latter shall take precedence. Reference to the test methods in this specification should specifically state the particular test or tests desired.

1.4 The values stated in SI units are to be regarded as the standard.

1.5 The following safety hazards caveat pertains only to the test methods portions 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.*

NOTE 1—ISO 6916-1 is similar to this specification.

2. Referenced Documents

2.1 *ASTM Standards:*

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 471 Test Method for Rubber Property—Effect of Liquids[3]

D 573 Test Method for Rubber—Deterioration in an Air Oven[3]

D 575 Test Methods for Rubber Properties in Compression[3]

D 832 Practice for Rubber Conditioning for Low-Temperature Testing[3]

D 883 Terminology Relating to Plastics[4]

D 1171 Test Method for Rubber Deterioration—Surface Ozone Cracking Outdoors or Chamber (Triangular Specimens)[3]

D 3182 Practice for Rubber—Materials, Equipment, and Procedures for Mixing Standard Compounds and Preparing Standard Vulcanized Sheets[3]

D 3183 Practice for Rubber—Preparation of Pieces for Test Purposes from Products[3]

2.2 *ISO Standard:*[5]

ISO 6916-1 Flexible Cellular Polymeric Materials: Sponge and Expanded Cellular Rubber Products—Specification Part 1 Sheet

3. Terminology

3.1 *Definitions*—See Terminology D 883.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *cellular material*—a generic term for materials containing many cells (either open or closed, or both) dispersed throughout the mass.

[1] This specification is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.22 on Cellular Materials - Plastics and Elastomers.

Current edition approved April 10, 2000. Published July 2000. Originally published as D 1056 – 49 T. Last previous edition D 1056 – 98.

[2] This version supercedes all prior versions of this specification.

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

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

[5] Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.

3.2.2 *closed cell*—a product whose cells are totally enclosed by its walls and hence not interconnecting with other cells.

3.2.3 *expanded rubber*—cellular rubber having closed cells made from a solid rubber compound.

3.2.4 *flexible cellular material*—a flexible cellular organic polymeric material that will not rupture within 60 s when a specimen 200 by 25 by 25 mm (8 by 1 by 1 in.) is bent around a 25-mm (1-in.) diameter mandrel at a uniform rate of 1 lap/5 s in the form of a helix at a temperature between 18 and 29°C (65 and 85°F).

3.2.5 *open cell*—a product whose cells are not totally enclosed by its walls and open to the surface, either directly or by interconnecting with other cells.

3.2.6 *rubber*—a material that is capable of recovering from large deformations quickly and forcibly, and can be, or already is, modified to a state in which it is essentially insoluble (but can swell) in boiling solvent (such as benzene, methyl ethyl ketone, and ethanol-toluene azeotrope).

3.2.7 *Discussion*—A rubber in its modified state, free of diluents, retracts within 1 min to less than 1.5 times its original length after being stretched at room temperature (20 to 27°C) to twice its length and held for 1 min before release.

3.2.8 *skin*—the textured outer surface on the material formed during manufacture by contact with molds, cover plate, air, or other curing medium.

3.2.9 *Discussion*—Normally, this skin is formed by contact with the mold or cover plates during manufacture. Molded open-cell (sponge) parts usually have a skin on all surfaces, except when cut to length from longer strips. Parts made by cutting from open-cell (sponge) sheets usually have skin on two faces and open cells at the cut edges. Closed-cell (expanded) rubber sheets are frequently split from thicker pieces and consequently do not have the skin faces. On some products it is desirable to add a solid rubber skin coating. The use to which the cellular rubber product is to be put determines the thickness of added skin required. Products subject to abrasion or open-cell (sponge) rubber that must withstand absorption of water or transmission of gases will ordinarily require an applied skin coating. Closed-cell (expanded) rubber does not usually require an added skin for these reasons.

3.2.10 *sponge rubber*—cellular rubber consisting predominantly of open cells made from a solid rubber compound.

4. Classification (Types, Classes, Grades, and Suffix Letters)

4.1 *Types*—These specifications cover two types of cellular rubber designated by the prefix numbers 1 and 2.

4.1.1 *Type 1*—Open-cell rubber.

4.1.2 *Type 2*—Closed-cell rubber.

4.1.3 See Section 3 for definitions of open and closed cell.

4.2 *Classes*—Both types are divided into four classes designated by the letters A, B, C, and D added to the number prefix. Basic requirements for classes are found in Tables 1 and 2.

4.2.1 *Class A*—Cellular rubber made from synthetic rubber, natural rubber, reclaimed rubber, or rubber-like materials, alone or in combination, where specific resistance to the action of petroleum base oils is not required.

4.2.2 *Class B*—Cellular rubber made from synthetic rubber or rubber-like materials alone or in combination, having specific requirements for oil resistance with low mass change.

4.2.3 *Class C*—Cellular rubber made from synthetic rubber or rubber-like materials alone or in combination, having specific requirements for oil resistance with medium mass change.

4.2.4 *Class D*—Cellular rubber made from synthetic rubber or rubber-like materials alone or in combination having specific requirements for extreme temperature resistance (−75 to 175°C) (−103 to 347°F); but specific resistance to the action of petroleum-base oils is not required.

4.3 *Grades*—Each type and class has been divided into a number of different grades. Each grade is based on a specific range of firmness as expressed by compression-deflection (see Sections 19 to 22). Grades are designated by digit, the softer grades being identified with the lower numbers and the higher grades being identified with the higher numbers.

4.3.1 *Grade 0*—For Types 1 and 2 cellular rubber, a compression-deflection range from 0 to 15 kPa (0 to 2 psi).

4.3.2 *Grade 1*—For Types 1 and 2 cellular rubber, a compression-deflection range from 15 to 35 kPa (2 to 5 psi).

4.3.3 *Grade 2*—For Types 1 and 2 cellular rubber, a compression-deflection range from 35 to 65 kPa (5 to 9 psi).

4.3.4 *Grade 3*—For Types 1 and 2 cellular rubber, a compression-deflection range from 65 to 90 kPa (9 to 13 psi).

4.3.5 *Grade 4*—For Types 1 and 2 cellular rubber, a compression-deflection range from 90 to 120 kPa (13 to 17 psi).

4.3.6 *Grade 5*—For Types 1 and 2 cellular rubber, a compression-deflection range from 120 to 170 kPa (17 to 25 psi).

NOTE 2—For conversion of types, classes, and grades to previous versions of Specification D 1056, see Appendix X1.

5. Materials and Manufacture

5.1 *Sponge Rubber*—Sponge rubber is made by incorporating into the compound a blowing agent, such as sodium bicarbonate, that gives off a gas which expands the mass during the vulcanization process. Sponge rubber is manufactured in sheet, strip, molded, or special shapes. Unless otherwise specified, sheet and strip sponge rubber shall have a natural skin on both the top and bottom surfaces. Fabric surface impressions are ordinarily not objectionable. The coarseness of the impressions shall be agreed upon between the parties concerned.

5.2 *Expanded Rubber*—Closed-cell rubber is made by incorporating gas-forming ingredients in the rubber compound, or by subjecting the compound to high-pressure gas, such as nitrogen. Expanded rubber is manufactured in sheet, strip, molded, tube, cord, and profile shapes by molding or extruding. Unless otherwise specified, the presence of skin on the top or bottom surfaces of sheet and strip expanded rubber shall be optional. Extruded shapes have skin on all surfaces except cut ends.

TABLE 1 Physical Requirements of Cellular Rubbers, Type 1, Open-Cell Sponge

Basic Requirements							
Grade Number	Compression Deflection, 25 % Deflection (Limits), kPa (psi)	Compression Deflection after Oven Aging, Change from Original		Oil-Aged 22 h at 70°C (158°F), Change in Volume in ASTM Oil No. 3 (IRM 903) (Limits),%	Compression Set, 50 % Deflection, max,%		Low-Temperature Flex, 5 h at 55°C (–67°F)
		168 h at 70°C (158°F)	22 h at 150°C (302°F)		22 h at 70°C (158°F)	22 h at 100°C (212°F)	
Class A, Non-oil-Resistant							
1A0	less than 15 (2)	±20[A]	...	...	15	...	...
1A1	15 to 35 (2 to 5)	±20	...	...	15	...	...
1A2	35 to 65 (5 to 9)	±20	...	...	15	...	...
1A3	65 to 90 (9 to 13)	±20	...	...	15	...	...
1A4	90 to 120 (13 to 17)	±20	...	...	15	...	...
1A5	120 to 170 (17 to 25)	±20	...	...	15	...	...
Class B, Oil-Resistant, Low Mass Change[B]							
1B0	less than 15 (2)	±20[A]	...	–25 to + 10	40	...	...
1B1	15 to 35 (2 to 5)	±20	...	–25 to + 10	40	...	...
1B2	35 to 65 (5 to 9)	±20	...	–25 to + 10	40	...	...
1B3	65 to 90 (9 to 13)	±20	...	–25 to + 10	40	...	...
1B4	90 to 120 (13 to 17)	±20	...	–25 to + 10	40	...	...
1B5	120 to 170 (17 to 25)	±20	...	–25 to + 10	40	...	...
Class C, Oil-Resistant, Medium Mass Change[B]							
1C0	less than 15 (2)	±20[A]	...	+ 10 to + 60	50	...	...
1C1	15 to 35 (2 to 5)	±20	...	+ 10 to + 60	50	...	...
1C2	35 to 65 (5 to 9)	±20	...	+ 10 to + 60	50	...	...
1C3	65 to 90 (9 to 13)	±20	...	+ 10 to + 60	50	...	...
1C4	90 to 120 (13 to 17)	±20	...	+ 10 to + 60	50	...	...
1C5	120 to 170 (17 to 25)	±20	...	+ 10 to + 60	50	...	...
Class D, High-Temperature-Resistant							
1D0	less than 15 (2)	...	±5	...	...	50	pass
1D1	15 to 35 (2 to 5)	...	±5	...	...	50	pass
1D2	35 to 65 (5 to 9)	...	±5	...	...	30	pass
1D3	65 to 90 (9 to 13)	...	±5	...	...	30	pass
1D4	90 to 120 (13 to 17)	...	±5	...	...	30	pass
1D5	120 to 170 (17 to 25)	...	±5	...	...	30	pass

TABLE 1 *Continued*

Requirements Added by Suffix Letters							
Grade Number	Compression Deflection, 25 % Deflection (Limits), kPa (psi)	A4	B1	F			M
		Compression Deflection after Oven Aging, Change from Original, 22 h, at 175°C (347°F), Limits, %	Compression Set, 50 % Deflection, 22 h at 70°C (158°F), max %	Low-Temperature Flex			Combustion Characteristics, max, 100 mm/min, (4 in./min)
				F1	F2	F3	
				5 h at –40°C (–40°F)	5 h at –55°C (–67°F)	5 h at –75°C (–103°F)	
	Class A, Non-oil-Resistant[A]						
1A0	less than 15 (2)	. . .	. . .	pass	pass	. . .	pass
1A1	15 to 35 (2 to 5)	. . .	. . .	pass	pass	. . .	pass
1A2	35 to 65 (5 to 9)	. . .	. . .	pass	pass	. . .	pass
1A3	65 to 90 (9 to 13)	. . .	. . .	pass	pass	. . .	pass
1A4	90 to 120 (13 to 17)	. . .	. . .	pass	pass	. . .	[pass
1A5	120 to 170 (17 to 25)	. . .	. . .	pass	pass	. . .	pass
	Class B, Oil-Resistant, Low Mass Change[B]						
1B0	less than 15 (2)	. . .	. . .	pass	. . .	. . .	pass
1B1	15 to 35 (2 to 5)	. . .	. . .	pass	. . .	. . .	pass
1B2	35 to 65 (5 to 9)	. . .	. . .	pass	. . .	. . .	pass
1B3	65 to 90 (9 to 13)	. . .	. . .	pass	. . .	. . .	pass
1B4	90 to 120 (13 to 17)	. . .	. . .	pass	. . .	. . .	pass
1B5	120 to 170 (17 to 25)	. . .	. . .	pass	. . .	. . .	pass
	Class C, Oil-Resistant, Medium Mass Change[B]						
1C0	less than 15 (2)	. . .	25	pass	. . .	. . .	pass
1C1	15 to 35 (2 to 5)	. . .	25	pass	. . .	. . .	pass
1C2	35 to 65 (5 to 9)	. . .	25	pass	. . .	. . .	pass
1C3	65 to 90 (9 to 13)	. . .	25	pass	. . .	. . .	pass
1C4	90 to 120 (13 to 17)	. . .	25	pass	. . .	. . .	pass
1C5	120 to 170 (17 to 25)	. . .	25	pass	. . .	. . .	pass
	Class D, High-Temperature-Resistant						
1D0	less than 15 (2)	±25	. . .	pass	. . .	pass	pass
1D1	15 to 35 (2 to 5)	±25	. . .	pass	. . .	pass	pass
1D2	35 to 65 (5 to 9)	±25	. . .	pass	. . .	pass	pass
1D3	65 to 90 (9 to 13)	±25	. . .	pass	. . .	pass	pass
1D4	90 to 120 (13 to 17)	±25	. . .	pass	. . .	pass	pass
1D5	120 to 170 (17 to 25)	±25	. . .	pass	. . .	pass	pass

[A] If this grade after aging still falls within the compression-deflection requirement of <15 kPa (2 psi), it shall be considered acceptable even though the change from the original is greater than ±20 %.

[B] Terminology was changed in 1997 from low swell to low mass change to better reflect the data obtained.

TABLE 2 Physical Requirements of Cellular Rubbers, Type 2, Closed-Cell Expanded

Basic Requirements									
Grade Number	Compression Deflection, 25 % Deflection (Limits), kPa (psi)	Oven-Aged, Change from Original Compression Deflection Values (Limits), %		Water Absorption, max, Change in Weight, %		Fluid Immersion, 7 Days at 23°C (73.4°F), max %[A]		Compression Set, 50 % Constant Deflection, 22 h at 100°C (212°F), max %	Low-Temperature Flex, 5 h at –55°C (–67°F)
		168 h at 70°C (158°F)	22 h at 150°C (302°F)	Density over 160 kg/m^3(10 lb/ft^3)	Density of 160 kg/m^3(10 lb/ft^3) or less	Density over 160 kg/m^3(10 lb/ft^3)	Density of 160 kg/m^3(10 lb/ft^3) or less		
	Class A, Nonfuel-Resistant								
2A0	less than 15 (2)	±30	...	5	10	...	...	...	...
2A1	15 to 35 (2 to 5)	±30	...	5	10	...	...	...	...
2A2	35 to 65 (5 to 9)	±30	...	5	10	...	...	...	...
2A3	65 to 90 (9 to 13)	±30	...	5	10	...	...	...	...

TABLE 2 *Continued*

2A4	90 to 120 (13 to 17)	±30	...	5	10	...	...	...	...
2A5	120 to 170 (17 to 25)	±30	...	5	10	...	...	...	...
	Class B, Fuel-Resistant, Low Mass Change[B]								
2B0	less than 15 (2)	±30	...	5	10	50	100	...	...
2B1	15 to 35 (2 to 5)	±30	...	5	10	50	100	...	...
2B2	35 to 65 (5 to 9)	±30	...	5	10	50	100	...	...
2B3	65 to 90 (9 to 13)	±30	...	5	10	50	100	...	...
2B4	90 to 120 (13 to 17)	±30	...	5	10	50	100	...	...
2B5	120 to 170 (17 to 25)	±30	...	5	10	50	100	...	...
	Class C, Fuel-Resistant, Medium Mass Change[B]								
2C0	less than 15 (2)	±30	...	5	10	150	250	...	...
2C1	15 to 35 (2 to 5)	±30	...	5	10	150	250	...	...
2C2	35 to 65 (5 to 9)	±30	...	5	10	150	250	...	...
2C3	65 to 90 (9 to 13)	±30	...	5	10	150	250	...	...
2C4	90 to 120 (13 to 17)	±30	...	5	10	150	250	...	...
2C5	120 to 170 (17 to 25)	±30	...	5	10	150	250	...	...
	Class D, High-Temperature-Resistant								
2D0	less than 15 (2)	...	±5	5	10	...	...	80	pass
2D1	15 to 35 (2 to 5)	...	±5	5	10	...	...	80	pass
2D2	35 to 65 (5 to 9)	...	±5	5	10	...	...	60	pass
2D3	65 to 90 (9 to 13)	...	±5	5	10	...	...	60	pass
2D4	90 to 120 (13 to 17)	...	±5	5	10	...	...	60	pass
2D5	120 to 170 (17 to 25)	...	±5	5	10	...	...	60	pass

Requirements Added By Suffix Letters

Grade Number	Compression Deflection 25 % Deflection (Limits), kPa (psi)	A				B		F			M
		Compression Deflection After Oven Aging, Change from Original Limits, %				Compression Set, 50 % Deflection, max %		Low Temperature Flex, 5 h at Temperature			Combustion Characteristics, 100 mm/min, max, (4 in./min)
		22 h at 100°C (212°F)	22 h at 125°C (257°F)	22 h at 150°C (302°F)	22 h at 175°C (350°F)	22 h at 23°C (73.4°F)	22 h at 23°C (73.4°F)	–40°C (–40°F)	–55°C (–67°F)	–75°C (–103°F)	
		A1	A2	A3	A4	B2	B3	F1	F2	F3	
2A0	less than 15 (2)	±30 %	±30 %	±30 %	±30 %	25 %	35 %	pass	pass	pass	pass
2A1	15 TO 35 (2 TO 5)	±30 %	±30 %	±30 %	±30 %	25 %	35 %	pass	pass	pass	pass
2A2	35 TO 65 (5 TO 9)	±30 %	±30 %	±30 %	±30 %	25 %	35 %	pass	pass	pass	pass
2A3	65 TO 90 (9 TO 13)	±30 %	±30 %	±30 %	±30 %	25 %	35 %	pass	pass	pass	pass
2A4	90 TO 120 (13 TO 17)	±30 %	±30 %	±30 %	±30 %	25 %	35 %	pass	pass	pass	pass
2A5	120 TO 170 (17 TO 25)	±30 %	±30 %	±30 %	±30 %	25 %	35 %	pass	pass	pass	pass
2B0	less than 15 (2)	±30 %	±30 %	±30 %	±30 %	25 %	35 %	pass	pass	pass	pass
2B1	15 TO 35 (2 TO 5)	±30 %	±30 %	±30 %	±30 %	25 %	35 %	pass	pass	pass	pass
2B2	35 TO 65 (5 TO 9)	±30 %	±30 %	±30 %	±30 %	25 %	35 %	pass	pass	pass	pass
2B3	65 TO 90 (9 TO 13)	±30 %	±30 %	±30 %	±30 %	25 %	35 %	pass	pass	pass	pass
2B4	90 TO 120 (13 TO 17)	±30 %	±30 %	±30 %	±30 %	25 %	35 %	pass	pass	pass	pass
2B5	120 TO 170 (17 TO 25)	±30 %	±30 %	±30 %	±30 %	25 %	35 %	pass	pass	pass	pass
2C0	less than 15 (2)	±30 %	±30 %	±30 %	±30 %	25 %	35 %	pass	pass	pass	pass
2C1	15 TO 35 (2 TO 5)	±30 %	±30 %	±30 %	±30 %	25 %	35 %	pass	pass	pass	pass
2C2	35 TO 65 (5 TO 9)	±30 %	±30 %	±30 %	±30 %	25 %	35 %	pass	pass	pass	pass
2C3	65 TO 90 (9 TO 13)	±30 %	±30 %	±30 %	±30 %	25 %	35 %	pass	pass	pass	pass
2C4	90 TO 120 (13 TO 17)	±30 %	±30 %	±30 %	±30 %	25 %	35 %	pass	pass	pass	pass
2C5	120 TO 170 (17 TO 25)	±30 %	±30 %	±30 %	±30 %	25 %	35 %	pass	pass	pass	pass
2D0	less than 15 (2)	NA[C]	NA[C]	NA[C]	±30 %	25 %	35 %	NA[C]	NA[C]	pass	pass
2D1	15 TO 35 (2 TO 5)	NA[C]	NA[C]	NA[C]	±30 %	25 %	35 %	NA[C]	NA[C]	pass	pass
2D2	35 TO 65 (5 TO 9)	NA[C]	NA[C]	NA[C]	±30 %	25 %	35 %	NA[C]	NA[C]	pass	pass
2D3	65 TO 90 (9 TO 13)	NA[C]	NA[C]	NA[C]	±30 %	25 %	35 %	NA[C]	NA[C]	pass	pass
2D4	90 TO 120 (13 TO 17)	NA[C]	NA[C]	NA[C]	±30 %	25 %	35 %	NA[C]	NA[C]	pass	pass
2D5	120 TO 170 (17 TO 25)	NA[C]	NA[C]	NA[C]	±30 %	25 %	35 %	NA[C]	NA[C]	pass	pass

[A] This test (see Sections 26-33) of weight change in Reference Fuel B is used in place of the usual oil-resistance test of volume change of No. 3 oil for the following reason: Oil or solvent immersion of flexible closed cellular materials usually causes loss of gas, by diffusion through the softened cell walls, that results in some shrinkage of the test sample. This shrinkage counteracts the swell that would normally occur, therefore invalidating test data based on volume change. Reference Fuel B is used because it produces a wider and more consistent differentiation among the A, B, and C classes than does the No. 3 oil.

[B] Standard oil resistance test methods give inconsistent results on closed cellular materials. This test gives a general indication of oil resistance but more reliable information should be obtained by testing in actual or simulated service conditions.

The values of 150 % maximum Class C and 50 % maximum Class B apply to cellular materials having densities of more than 160 kg/m ^{3}(10 lb/ft^3). For cellular materials with densities of 160 kg/m^3 or less, the values of maximum mass change allowed are 250 % for Class C and 100 % for Class B.

Terminology was changed in 1997 from low swell to low mass change to better reflect the data obtained.

[C]NA = Not applicable. Already covered as a basic requirement in Table 2.

6. Physical Properties

6.1 The various grades of cellular rubber shall conform to the requirements as to physical properties in Table 1 and Table 2together with any additional requirements indicated by suffix letters in the grade designations as described in Section 4 and Table 3.

7. Tolerances on Dimensions

7.1 Tolerances on dimensions of cellular rubber products shall be as specified in Table 4.

8. Color

8.1 Unless otherwise specified, the color of cellular rubber shall be black.

9. Workmanship, Finish, and Appearance

9.1 Cellular rubber furnished under this specification shall be manufactured from synthetic rubber, natural rubber, or rubber-like materials together with added compounding ingredients of such nature and quality that the finished product complies with the specification requirements. In permitting choice in use of those materials by the producer, it is not intended to imply that the different rubber materials are equivalent in respect to all physical properties. Any special characteristics other than those prescribed in this specification that may be desired for specific applications shall be specified in the product specifications, as they may influence the choice of the type of rubber material or other ingredients used. All materials and workmanship shall be in accordance with good commercial practice, and the resulting cellular rubber shall be free from defects affecting serviceability.

10. Test Methods

10.1 Unless specifically stated otherwise, all tests shall be made in accordance with the methods specified in Sections 14-67 and Table 3.

11. Sampling

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

11.2 When it is necessary or advisable to obtain test specimens from the article, as in those cases where the entire sample is not required or adaptable for testing, the method of cutting and the exact position from which specimens are to be taken shall be specified. The apparent density and the state of cure may vary in different parts of the finished product, especially if the article is of complicated shape or of varying thickness, and these factors affect the physical properties of the specimens. Also, the apparent density is affected by the number of cut surfaces as opposed to the number of skin-covered surfaces on the test specimen.

11.3 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, solid covers, adhesion to metal, or other reasons, standard test slabs shall be prepared. When differences due to the difficulty in obtaining suitable test specimens from the finished part arise, the manufacturer and the purchaser may agree on acceptable deviations. This can be done by comparing results of standard test specimens and those obtained on actual parts.

12. Inspection and Rejection

12.1 All tests and inspection shall be made at the place of manufacture prior to shipment, unless otherwise specified. The manufacturer shall afford the inspector all reasonable facilities for tests and inspection.

12.2 The purchaser may make the tests and inspection to govern acceptance or rejection of the material at his own laboratory or elsewhere. Such tests and inspection shall be made not later than 15 days after receipt of the material.

12.3 All samples for testing, provided as specified in Section 11, shall be visually inspected to determine compliance with the material, workmanship, and color requirements.

12.4 Any material that fails in one or more of the test requirements may be retested. For this purpose, two additional tests shall be made for the requirement in which failure occurred. Failure of either of the retests shall be cause for final rejection.

12.5 Rejected material shall be disposed of as directed by the manufacturer.

13. Packaging and Package Marking

13.1 The material shall be properly and adequately packaged. Each package or container shall be legibly marked with the name of the material, name or trademark of the manufacturer, and any required purchaser's designations.

GENERAL TEST METHODS

14. Scope

14.1 Except as otherwise specified in these test methods, the following ASTM test methods and the various test methods in Table 3, applicable in general to vulcanized rubber, shall be complied with as required and are hereby made a part of these test methods:

14.1.1 *General Physical Test Requirements*— Practices D 3182 and D 3183.

14.1.2 *Aging Test*—Test Method D 573, with modifications as described in Sections 16-22 .

14.1.3 *Compression Set, Suffix B*—Test method described in Sections 49-55.

14.1.4 *Fluid Immersion, Suffix E*—Test Method D 471 and Sections 23-33.

14.1.5 *Low-Temperature Test, Suffixes F1, F2, and F3*—Test method described in Sections 56-60 . Suitable low-temperature cabinets and conditioning procedures are described in Practice D 832.

14.2 In case of conflict between provisions of the test methods referenced in 14.1.1-14.1.5 and the procedures specifically described herein for cellular rubbers, the latter shall take precedence.

15. Test Specimens and Slabs

15.1 *Test Specimens*—Standard test specimens shall be disks 28.00 ± 0.50 mm (1.10 ± 0.02 in.) in diameter, which yields a 645.70-mm^2(1-in.^{2}) specimen. The specimens may be