



Designation: D1056 – 20

Standard Specification for Flexible Cellular Materials—Sponge or Expanded Rubber^{1,2}

This standard is issued under the fixed designation D1056; 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 U.S. Department of Defense.

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 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.

1.5 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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.

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

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:³

- D395 Test Methods for Rubber Property—Compression Set
- D412 Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension
- D471 Test Method for Rubber Property—Effect of Liquids
- D573 Test Method for Rubber—Deterioration in an Air Oven
- D575 Test Methods for Rubber Properties in Compression
- D624 Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers
- D832 Practice for Rubber Conditioning For Low Temperature Testing
- D883 Terminology Relating to Plastics
- D1171 Test Method for Rubber Deterioration—Surface Ozone Cracking Outdoors (Triangular Specimens)
- D2632 Test Method for Rubber Property—Resilience by Vertical Rebound
- D3182 Practice for Rubber—Materials, Equipment, and Procedures for Mixing Standard Compounds and Preparing Standard Vulcanized Sheets
- D3183 Practice for Rubber—Preparation of Pieces for Test Purposes from Products
- D5132 Test Method for Horizontal Burning Rate of Polymeric Materials Used in Occupant Compartments of Motor Vehicles

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.

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.

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² This version supersedes all prior versions of this specification.

³ 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.

*A Summary of Changes section appears at the end of this standard

E456 Terminology Relating to Quality and Statistics
E2935 Practice for Conducting Equivalence Tests for Comparing Testing Processes

2.2 *ISO Standard*.⁴

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

3. Terminology

3.1 *Definitions*—Terms used in this standard are defined in accordance with Terminology **D883**, unless otherwise specified. For terms relating to precision and bias and associated issues, the terms used in this standard are defined in accordance with Terminology **E456**.

3.2 *Definitions of Terms Specific to This Standard*:

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

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

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

3.2.4 *flexible cellular material, n*—a cellular polymer that will not visibly rupture within a specified time when a specimen is bent around a 25.4 mm (1.0 in.) mandrel 180 degrees within an agreed upon period of time and at a predetermined temperature.

3.2.5 *open cell, n*—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, n*—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).

3.2.6.1 *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 68 to 80.6°F to twice its length and held for 1 min before release.

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

3.2.7.1 *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.

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

4. Classification (Types, Classes, and Grades)

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 –103 to 347°F (–75 to 175°C); 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 18 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 2 psi (0 to 13.8 kPa).

4.3.2 *Grade 1*—For Types 1 and 2 cellular rubber, a compression-deflection range from 2 to 5 psi (13.8 to 34.5 kPa).

4.3.3 *Grade 2*—For Types 1 and 2 cellular rubber, a compression-deflection range from 5 to 9 psi (34.5 to 62.1 kPa).

4.3.4 *Grade 3*—For Types 1 and 2 cellular rubber, a compression-deflection range from 9 to 13 psi (62.1 to 89.6 kPa).

4.3.5 *Grade 4*—For Types 1 and 2 cellular rubber, a compression-deflection range from 13 to 17 psi (89.6 to 117.2 kPa).

4.3.6 *Grade 5*—For Types 1 and 2 cellular rubber, a compression-deflection range from 17 to 25 psi (117.2 to 172.4 kPa).

⁴ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.