Designation: D 3676 – 01

Standard Specification for Rubber Cellular Cushion Used for Carpet or Rug Underlay[1]

This standard is issued under the fixed designation D 3676; 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 high-density cellular rubber adhered to carpet, rugs, or various substrates for use as separate underlay. This standard may also be used as a specification for separately blown sponge used as carpet underlay.

1.2 This specification provides material and dimensional requirements and test methods for specific properties of compression set, compression resistance, delamination strength, and accelerated aging.

NOTE 1—This specification does not include requirements for burning characteristics. It shall be noted that Flammable Fabrics Act Regulations FF1-70, Standard for the Surface Flammability of Carpets and Rugs, and FF2-70, Standard for the Surface Flammability of Small Carpets and Rugs,[2] may be applicable for carpets and rugs with integral backing of rubber cellular cushion.

1.3 *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 2—There is no similar or equivalent ISO standard.

2. Referenced Documents

2.1 *ASTM Standards:*

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

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

D 751 Test Methods for Coated Fabrics[4]

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

D 3574 Test Methods for Flexible Cellular Materials—Slab, Bonded, and Molded Urethane Foams[4]

D 3767 Practice for Rubber—Measurement of Dimensions[3]

2.2 *Federal Standard:*

Fed. Std. No. 191 Textile Test Methods, Method 5100—Breaking Strength and Elongation of Woven Cloth; Grab Method[5]

3. Significance and Use

3.1 The purpose of this specification is to provide meaningful tests for rubber cellular cushion used for carpet or rug underlay.

4. Classification

4.1 The following classes of flexible, cellular, high-density rubber adhered to carpets, rugs, and separate substrates are covered.

4.1.1 *Class A*, for moderate traffic use within one and two family, multi-family, and care-type dwelling units. Moderate traffic areas are areas such as living rooms, dining rooms, bedrooms, and recreation rooms.

4.1.2 *Class B*, for heavy traffic use for public areas such as lobbies and corridors of multifamily and care-type facilities; entrances, stairways, and elevators.

5. Physical Requirements

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

6. Sampling and Sample Preparation

6.1 Select representative samples of the lot being examined at random as required.

6.2 Each sample shall consist of a 200-mm (8-in.) wide strip taken across the full width of the finished rug, carpet or underlayment, or other substrate. For narrow products such as runners, it may be necessary to use a strip 300 mm (12 in.) or more to furnish all the test specimens. If the product is not homogeneous across the full width, reject the sample and obtain another sample. Prior to cutting, read the sample requirements so as to plan the cutting pattern properly.

6.3 Mark off 150 mm (6 in.) from the outer edges of the sample and cut all specimens from inside these lines. Divide this inside width into three approximately equal parts. After cutting the specimens, identify the originating area on the foam side.

[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.

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[2] Code of Federal Regulations, Vol 16, Chapter II, Parts 1630 and 1632.

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

[4] *Annual Book of ASTM Standards*, Vol 09.02.

[5] Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111–5094, Attn: NPODS.

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

TABLE 1

Characteristic	Class A	Class B	ASTM Method
Mass per unit area, min, $kg/m^2(oz/yd^2)$	1.3 (38.0)	1.6 (46.0)	Section 10 of D3676
Thickness, min, mm (in.)	3 (0.12)	3 (0.12)	Section 11 of D3676
Density, min, kg/m^3 (lb/ft^3)	270 (17)	320 (20)	Section 12 of D3676
Compression Resistance, min, kPa (psi)	21 (3)	31 (4.5)	Section 13 of D3676
Constant deflection compression set, max, %	15	15	D 395, Method B with changes as in Section 14 of D3676
Delamination resistance, min, N/min (lbf/in.)	350 (2)	350 (2)	Section 15 of D3676
Accelerated aging		Samples shall pass the stated requirements	D 573 with changes as in Section 16 of D3676
Tensile strength, min, kPa (psi)	55 (8)	55 (8)	D 3574
Compression Force Deflection, KPa (psi)	— —	— —	D 3574

6.4 Cut three 50 mm by 150-mm (2 in. by 6-in.) specimens from the sample, one from each side area and one from the center. Cut the long dimension parallel to the warp threads of the carpet or rug.

6.5 Die-cut six 100 mm by 100-mm (4 in. by 4-in.) specimens, two from each side area and two from the center. Die-cut the specimens with the foam side against the cutting die.

6.6 Cut at least one 50 mm by 100-mm (2 in. by 4-in.) specimen from the remaining sample.

7. Test Methods

7.1 Unless specifically stated otherwise, all tests shall be made in accordance with the methods specified in Sections 9-16.

8. Inspection and Rejection

8.1 All tests and inspection shall be made at the place of manufacture prior to shipment unless otherwise specified.

8.2 Any material that fails in one or more of the test requirements may be resampled at another area and retested. Failure of the retest shall be cause for final rejection.

8.3 The manufacturer shall certify that the material is in compliance with this specification.

9. Test Conditions

9.1 Condition the specimens to equilibrium with a 50 ± 5 % relative humidity atmosphere at 23 ± 2°C (73 ± 4°F). If other conditions are used, note the condition of the test.

10. Area Density of Foam Backing

10.1 *Procedure*—Weigh the six 100 mm by 100-mm (4 in. by 4-in.) specimens separately and record the mass to the nearest 0.01 g. Using suitable equipment, for example, an electric carving knife and supporting guides, separate the foam backing from the primary carpet backing by cutting at the line where the textile component meets the foam component. Cut as closely as possible without damaging the primary carpet backing. Keep the foam specimens for further tests. Remove any remaining foam from the primary carpet backing by brushing it with a stiff wire-bristle brush. Weigh each carpet specimen separately and record the mass to the nearest 0.01 g.

10.2 *Calculation*—For each specimen, calculate the mass (M) of the foam as the difference between the total mass and the mass of the carpet with foam backing removed. Report the average of the six results. Calculate the mass per unit area in kilograms per square metre by dividing the average mass by the area of the specimen. (For specimens 100 mm by 100 mm (4 in. by 4 in.), the area density in kilograms per square metre = 0.1 M, when M is expressed in grams.)

10.3 *Precision and Bias*—See Test Methods D 3574, Test A.

11. Thickness

11.1 *Procedure*—Measure the thickness of each of the six 100 mm by 100-mm (4 in. by 4-in.) foam specimens to the nearest 0.02 mm, by means of a thickness gage having a circular presser foot with an area of 650 mm^2 (1 $in.^2$) and exerting a pressure of 1.5 kPa (0.22 psi). Apply the force slowly without impact and read the thickness gage immediately. Report the average of the six readings.

11.2 *Precision and Bias*—See Practice D 3767, Method A 2.

12. Volume Density

12.1 *Procedure*—Weigh each of the six 100 mm by 100-mm (4 in. by 4-in.) foam specimens to the nearest 0.01 g.

12.2 *Calculation*—Calculate the density for each specimen as follows:

$$d = 100\,M/T \tag{1}$$

where:
d = density, kg/m^3,
M = Mass, g, and
T = Thickness, mm.

Report the average of the six determinations.

12.3 *Precision and Bias*—See Test Methods D 3574, Test A.

13. Compression Resistance

13.1 *Procedure*—Cut each of the 100 mm by 100-mm (4 in. by 4-in.) foam specimens into four 50 mm by 50-mm (2 in. by 2-in.) specimens. Form two sets of plied specimens approximately 25 mm (1 in.) thick, skin side to cut side. Place the plied specimen in a compression tester and, with a presser foot that is larger than the surface area of the specimen, determine the total thickness of the plied specimen with a prestress of 1.5 kPa (0.22 psi). Compress the plied specimen to 75 ± 1 % of its original thickness at 0.83 ± 0.08 mm/s (2 ± 0.2 in./min) and immediately determine the total force in kN (lbf). Report the average of the two results.

13.2 *Calculation*—Calculate the compression resistance as follows:

$$C_R = (A/B) - D \tag{2}$$

where:
C_R = compression resistance, kPa (psi),
A = force, kN (lbf),
B = area, m^2, ($in.^2$), and