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Used in USDOE-NE Standards

Standard Specifications for Flexible Cellular Materials—Latex Foam[1]

This standard is issued under the fixed designation D 1055; 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 These specifications,[2] including test methods, apply to flexible cellular rubber products known as latex foam rubbers but do not apply to sponge and expanded rubbers. The base material used in their manufacture may be natural rubber, reclaimed rubber, synthetic rubber, or rubber-like materials, alone or in combination.

1.2 In case of conflict between the provisions of these general specifications and those of detailed specifications or test methods for a particular product, the latter shall take precedence. Reference to methods for testing cellular rubber products should specifically state the particular test or tests desired.

1.3 The values stated in SI units are to be regarded as the standard. The values in parentheses are for information only.

1.4 The following precautionary caveat pertains only to the test methods portions, Sections 8, 16, 18, 23, 26, 29, and 31, of these specifications: *This standard may involve hazardous materials, operations, and equipment. 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:*

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

D 454 Test Method for Rubber—Deterioration by Heat and Air Pressure[3]

D 572 Test Method for Rubber—Deterioration by Heat and Oxygen[3]

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

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

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]

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *flexible cellular rubber*—a cellular organic polymeric material that will not rupture within 60 s when a specimen 200 by 25 by 25 mm is bent around a 25-mm diameter mandrel at a uniform rate to produce 1 lap in 5 s in the form of a helix at a temperature between 18 and 29°C.

3.1.2 *rubber*—the term rubber is used to include both natural and synthetic types.

3.1.3 *skin*—the smooth surface of the latex foam rubber product, formed by contact with the mold or cover plates, is defined as a natural skin.

4. Materials and Manufacture

4.1 *Latex Foam Rubbers*—The structure of latex foam rubbers consists of a network of open or interconnecting cells. Latex foam rubbers are made from rubber latices or liquid rubbers. They are manufactured in sheet, strip, molded, or specific shapes. Latex foam rubbers shall have a vulcanized cellular structure with a porous surface. The cells shall be interconnecting and of a uniform character. Latex foam rubbers may be either cored or solid. Size, shape, and distribution of coring shall be at the producer's option but subject to the approval of the purchaser.

5. Grades of Latex Foam Rubbers

5.1 Latex foam rubbers shall have their grade numbers designated by two letters which identify the kind of latex foam rubber as follows:

RC—Latex foam rubbers, cored, and

[1] These specifications are under the jurisdiction of ASTM Committee D-20 on Plastics and are the direct responsibility of Subcommittee D20.22 on Cellular Plastics.

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[2] These specifications together with Specification D 1056 replace the former Tentative Methods of Testing Cellular Rubber Products (D 552 – 46a T) and the Tentative Specifications for Cellular Rubber Products (D 798 – 46a T), which were accordingly discontinued in 1949.

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

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

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

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RU—Latex foam rubbers, uncored.

Digits following the letters are used to indicate the degree of firmness, the softer grades being identified with the lower numbers and the firmer grades with the higher numbers (see Table 1).

5.2 *Suffix Letters* may be added singly or in combination after any grade number to indicate additional requirements beyond those specified in Table 1 as basic requirements. The significance of the approved suffix letters is as follows:

SIGNIFICANCE OF SUFFIX LETTERS

Suffix Letters
- C—Weather Resistance[A]
- D—Load Deflection[A]
- E—Oil Resistance[A] Note that there are no requirements for oil resistance in these specifications.
- F1—Low-Temperature Brittleness at − 40°C (−40°F) Required with values as specified in Table 1
- F2—Low-Temperature Brittleness at − 55°C (−67°F)[A]
- G—Tear Resistance[A]
- H—Flex Resistance Test required with values specified in Table 1
- J—Abrasion Resistance[A]
- K—Adhesion Resistance[A]
- L—Water Resistance[A]
- M—Flammability Resistance[A]
- P—Non-Staining[A]
- R—Resilience[A]
- Z—Special Requirements[A]

[A] Test method and values to be arranged between the purchaser and the supplier.

NOTE 1—*Example*: Grade RC 20 F1H denotes soft, cored latex foam rubber made from natural, reclaim synthetic, or a blend with a load deflection value of 89 ± 18 N (20 ± 4 lbf) and requiring in addition to the basic tests a low-temperature test at −40°C (−40°F) and a flexing test.

6. Physical Properties

6.1 The various grades of latex foam rubber shall conform to the requirements as to physical properties prescribed in Table 1, together with any additional requirements indicated.

6.2 When subjected to the static fatigue test the latex foam specimen shall show no cracking at the folded edge.

7. Tolerances on Dimensions

7.1 Tolerances on dimensions of latex foam rubber products are given in Table 2 and Table 3.

8. Workmanship, Finish, and Appearance

8.1 Latex foam rubbers furnished under these specifications shall be manufactured from natural rubber, synthetic 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 these specifications which may be desired for specific applications shall be specified in the products specifications, as they may influence the choice of the type of rubber materials or other ingredients used. All materials and workmanship shall be in accordance with good commercial practice, and the resulting cellular rubber shall be free of defects affecting serviceability.

8.2 Due to manufacturing conditions, material may have to be altered or repaired. This repaired or altered material will be

TABLE 1 Physical Requirements of Latex Foam Rubbers

Grade Number	Basic Requirements					Requirements Added by Suffix Letters		
						Suffix F	Suffix H	
	Indentation Value on 325 cm^2 (50 $in.^2$), 25 % Deflection (Limits)		Air Oven Aged 22 h at 100°C (212°F) Change from Original Load-Deflection or Indentation Value (Limits), %	Constant Deflection Compression Set 22 h at 70°C (158°F), 50 % Deflection, max, %		Low Temperature Test, Change from Original Deflection, max, %	Flexing Test Compression Set, max, %	
	N	lbf		C_h[A]	C_d[A]		C_h[A]	C_d[A]
Latex Foam Rubbers (Cored)								
RC 5	22±13	5±3	±20	10	20	75	5	10
RC 10	44±13	10±3	±20	10	20	75	5	10
RC 15	67±18	15±4	±20	10	20	75	5	10
RC 20	89±18	20±4	±20	10	20	75	5	10
RC 25	111±22	25±5	±20	10	20	75	5	10
RC 30	133±27	30±6	±20	10	20	75	5	10
RC 40	178±31	40±7	±20	10	20	75	5	10
RC 50	222±36	50±8	±20	10	20	75	5	10
RC 60	267±40	60±9	±20	10	20	75	5	10
RC 70	311±53	70±12	±20	10	20	75	5	10
RC 90	400±62	90±14	±20	10	20	75	5	10
Latex Foam Rubbers (Uncored)								
RU 11	49±18	11±4	±20	10	20	75	5	10
RU 20	89±22	20±5	±20	10	20	75	5	10
RU 35	156±44	35±10	±20	10	20	75	5	10
RU 55	245±44	55±10	±20	10	20	75	5	10
RU 80	356±67	80±15	±20	10	20	75	5	10
RU 150	667±245	150±55	±20	10	20	75	5	10

[A] As defined in Section 19.

TABLE 2 Tolerances on Dimensions of Latex Foam Rubber Products for General Applications

Dimension	Tolerance		Dimension	Tolerance	
	+	−		+	−
Thickness, mm			Thickness, in.		
Cored			Cored		
0 to 76, incl	3	2	0 to 3, incl	1/8	1/16
76 to 127, incl	5	3	3 to 5, incl	3/16	1/8
127 and over	6	5	5 and over	1/4	3/16
Uncored			Uncored		
Up to and including 12.7	2	2	Up to and including 1/2	1/16	1/16
From 12.7 to 25.4, incl	3	2	From 1/2 to 1, incl	1/8	1/16
Over 25.4	3	5	Over 1	1/8	3/16
Length and Width, mm			Length and Width, in.		
Cored			Cored		
0 to 152, incl	5	2	0 to 6, incl	3/16	1/16
152 to 305, incl	10	3	6 to 12, incl	1/2	1/8
305 to 610, incl	13	6	12 to 24, incl	1/2	1/4
610 to 914, incl	16	10	24 to 36, incl	5/8	3/8
914 to 1219, incl	19	13	36 to 48, incl	3/4	1/2
1219 to 1524, incl	22	16	48 to 60, incl	7/8	5/8
1524 to 1829, incl	25	19	60 to 72, incl	1	3/4
1829 and over	29	22	72 and over	1 1/8	7/8
Uncored			Uncored		
0 to 152, incl	8	2	0 to 6, incl	5/16	1/16
152 to 305, incl	13	3	6 to 12, incl	1/2	1/8
305 to 610, incl	18	6	12 to 24, incl	11/16	1/4
610 to 914, incl	22	10	24 to 36, incl	7/8	3/8
914 to 1219, incl	29	13	36 to 48, incl	1 1/16	1/2
1219 to 1524, incl	35	16	48 to 60, incl	1 1/4	5/8
1524 to 1829, incl	38	19	60 to 72, incl	1 3/8	3/4
1829 and over	41	22	72 and over	1 1/2	7/8

TABLE 3 Tolerances for Special Applications of Latex Foam Rubbers, Such as Automotive Topper Pads, Spring Coverings, etc.

Dimension	Tolerance		Dimension	Tolerance	
	+	−		+	−
Thickness, mm			Thickness, in.		
Cored			Cored		
0 to 76, incl	5	2	0 to 3, incl	3/16	1/16
76 to 127, incl	6	3	3 to 5, incl	1/4	1/8
127 and over	8	5	5 and over	5/16	3/16
Uncored			Uncored		
Up to and including 12.7	2	2	Up to and including 1/2	1/16	1/16
From 12.7 to 25.4, incl	3	2	From 1/2 to 1, incl	1/8	1/16
Over 25.4	3	3	Over 1	1/8	1/8
Length and Width, mm			Length and Width, in.		
Cored and Uncored			Cored and Uncored		
0 to 152, incl	8	2	0 to 6, incl	5/16	1/16
152 to 305, incl	13	3	6 to 12, incl	1/2	1/8
305 to 610, incl	18	6	12 to 24, incl	11/16	1/4
610 to 914, incl	22	10	24 to 36, incl	7/8	3/8
914 to 1219, incl	29	13	36 to 48, incl	1 1/8	1/2
1219 to 1524, incl	35	16	48 to 60, incl	1 3/8	5/8
1524 to 1829, incl	38	19	60 to 72, incl	1 1/2	3/4
1829 and over	41	22	72 and over	1 5/8	7/8

acceptable under these specifications provided the material used in such repairs or alterations shall be the same composition and quality as the original product and provided such alterations do not affect the serviceability, size, and shape beyond tolerances as provided herein.

8.3 Unless otherwise specified, the color of latex foam rubbers shall be optional with the manufacturer.

9. Sampling

9.1 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.

9.2 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, more 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.

9.3 When the finished product does not lend itself to testing or to the taking of test specimens because of complicated shape or other reasons, the manufacturer and the purchaser shall agree on the preparation of a suitable test specimen. 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.

10. Test Methods

10.1 Unless specifically stated otherwise all tests shall be made in accordance with the methods specified in Sections 15-31, which include test procedures for the following:

Procedures	Sections
Basic tests:	
Air oven test	15 and 16
Constant deflection compression set	17-19
Indentation load deflection test	20-23
Suffix tests:	
H—Flexing test	24-26
F—Low-temperature test	27-30
Static fatigue test	31

11. General Methods

11.1 Except as otherwise specified in these methods of testing latex foam rubbers, the following test methods of the American Society for Testing and Materials, applicable in general to vulcanized rubber, shall be complied with as required and are hereby made a part of these test methods.

11.1.1 *General Physical Test Requirements*—Practices D 3182 and D 3183

11.1.2 *Aging Test*—Test Methods D 572, D 573, and D 454.

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

11.1.4 *Low-Temperature Test, Suffixes F1 and F2*—Method described in Sections 27-30 of these specifications.

11.2 In case of conflict between provisions of the above methods and the procedures herein specifically described for latex foam rubbers, the latter shall take precedence. In case of conflict between the procedures herein described for latex foam rubbers and the methods of a particular specification or for a particular latex foam rubber product, the latter shall take precedence.

12. Measurements of Test Specimens

12.1 The length and width shall be measured with a steel scale or tape. Care shall be taken not to distort the latex foam.

12.2 Thicknesses up to and including 25 mm (1 in.) shall be measured using a dial-type gage[5] having a foot 32 mm (1¼ in.) in diameter, taking care not to compress the sample. Thicknesses over 25 mm shall be measured using a sliding caliper gage or as specified in 12.1. When a sliding caliper gage is employed, the gage setting shall be made with the gage out of contact with the latex foam rubber. The sample shall be passed through the previously set gage and the proper setting shall be the one when the measured faces of the gage contact the surfaces of the article without compressing it.

12.3 The steel scale or tape used to measure length or width shall be graduated to 1 mm (1/32 in.). The dial gage for measuring thickness shall be graduated to 0.02 mm (0.001 in.). The calipers used for measuring thickness shall be graduated to 0.1 mm (0.005 in.).

12.4 Results reported shall be the average of a minimum of three measurements.

13. Inspection and Rejection

13.1 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, without charge, for tests and inspection.

13.2 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.

13.3 All samples for testing, provided as specified in Section 9., shall be visually inspected to determine compliance with the material, workmanship, and color requirements.

13.4 Any material which 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.

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

14. Packaging and Package Marking

14.1 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.

ACCELERATED AGING TESTS

15. Test Specimen

15.1 The test specimen used in any of the aging tests shall be that required by the latex foam rubber methods for the particular determination which is to be employed for measuring the effect of the aging exposure.

16. Test Methods

16.1 Either the oxygen-pressure-chamber aging test as described in Test Method D 572, the air-oven aging test as described in Test Method D 573, or the air-pressure heat test as

[5] A gage similar to Federal Products Co. No. 57B-1-Y 7692 is satisfactory.

described in Test Method D 454, respectively, may be used for latex foam rubbers, as specified, except that in the air-pressure heat test an air pressure of 415 ± 15 kPa (60 ± 2 psi) shall be used in place of the 550 ± 15 kPa (80 ± 2 psi) prescribed in Test Method D 454. Deterioration may be expressed as percentage change of compression-deflection values, or the results may be determined by visual observation for signs of hardening, brittleness, tackiness, etc. No relation between accelerated aging tests and natural aging is given or implied.

NOTE 2—**Caution:** Do not exceed the pressures or temperatures specified in Test Methods D 454, D 572, or D 573. Before aging material of unknown quality, review the caution notes in the above mentioned test methods. Age only a small specimen first to determine if the rate of oxidation is slow enough to lessen any chance of uncontrolled oxidation or explosion.

COMPRESSION SET UNDER CONSTANT DEFLECTION (Calculations are Based on Amount of Deflection)

17. Test Specimen

17.1 The specimen for this test shall have parallel top and bottom surfaces. A cylinder 29 mm (1.129 in.) in diameter shall be suitable for slab or uncored stock. Cored stock specimens may be round or rectangular. The minimum dimension on the top and bottom surfaces must be greater than the height of the sample, and the surface shall have a minimum area of 0.01 m^2 (16 $in.^2$). The thickness of the test specimen may vary, but shall be not less than 19 mm (¾ in.) for slab or uncored stock. The thickness shall be measured and stated in the report.

18. Test Methods

18.1 The apparatus and procedure shall be the same as that prescribed in Method B of Test Methods D 395, except as follows: Compress test specimens 50 % of their original thickness. Release force at the end of the test period and measure the thickness after 30 min rest at room temperature. Measure thickness as described in Section 12. The temperature of the test shall be 70°C (158°F). The time of the test shall be as specified. Chromium-plated metal plates are not required. Aluminum plates or any stiff plates that are clean and smooth, and that will not deflect measurably under the load necessary for deflection of the specimen may be used.

19. Calculation

19.1 Calculate the constant deflection compression set, expressed as a percentage of the original height, as follows:

$$C_h = (t_0 - t_1)/t_0 \times 100 \quad (1)$$

where:

C_h = compression set, expressed as a percentage of the original height,
t_0 = original height of test specimen, and
t_1 = height of test specimen 30 min + 10 or −0 min after removal from the apparatus.

19.2 Calculate the constant deflection compression set, expressed as a percentage of the original deflection, as follows:

$$C_d = (t_0 - t_1/t_0 - t_s) \times 100 \quad (2)$$

where:

C_d = compression set, expressed as a percentage of the original deflection,
t_0 = original height of test specimen,
t_1 = height of test specimen 30 min + 10 or −0 min after removal from the apparatus, and
t_s = height of spacer bar used.

INDENTATION TEST

20. Scope

20.1 The test consists of measuring the force necessary to produce a 25 % indentation in the latex foam rubber product.

21. Apparatus

21.1 An apparatus having a flat circular indentor foot 0.03 m^2 (50 $in.^2$) in area, connected to a force-measuring device by means of a ball-and-socket joint, and mounted in such a manner that the product or specimen can be deflected at a rate of 0.2 to 10 mm/s (0.5 to 25.0 in./min) shall be used for this test. A maximum radius of 2 mm (0.08 in.) is allowable on the edge of the indentor foot. The apparatus shall be arranged to support the specimen on a level horizontal plate which is perforated with 6-mm (0.25-in.) holes on 20-mm (0.75-in.) centers to allow for rapid escape of air during the test.

NOTE 3—When testing products with parallel top and bottom surfaces the ball-and-socket joint is not required.

22. Test Specimen

22.1 The test specimen shall consist of the entire product sample or a suitable portion of it, except that in no case shall the surface for indentation have dimensions less than 300 by 300 mm (12 by 12 in.). The thickness shall be not less than 19 mm (¾ in.).

23. Test Methods

23.1 Place the test specimen in position on the supporting plate of the apparatus. In case the product has one side cored or honeycombed, allow this face to rest on the perforated plate. The specimen position shall be such that the indentation will be made at the center of all articles except where the contour makes this impractical.

23.2 Bring the indentor foot into contact with the specimen and determine the original height after applying an initial force of 4.5 N (1 lbf). Compress the specimen 25 % of this original height and observe the final force in newtons (pounds) including the 4.5-N (1-lbf) preload approximately 5 s after the foot has come to rest. The result obtained in this test is influenced by temperature and humidity conditions, and tests which are to be compared shall be conducted under substantially the same conditions. In all cases, report the actual temperature and humidity during the test.

23.3 In cases of dispute, perform the compression readings at a temperature of 23 ± 1.1 °C (73.4 ± 2°F) and in an atmosphere having a relative humidity of 50 ± 2 %. Condition the specimen undeflected and undistorted at this temperature and humidity for at least 12 h before being tested. Ordinarily make only one test, but in cases of dispute express the result as the average of a minimum of three tests.

FLEXING TESTS (SUFFIX H)

24. Scope

24.1 The flexing test consists of subjecting the test specimen to repeated compression and noting the effect on the cellular structure.

25. Test Specimen

25.1 The test specimen shall consist of the entire product sample or a suitable portion of it as agreed upon by the manufacturer and the purchaser. The full thickness of the product shall be used.

26. Test Methods

26.1 Place the test specimen centrally on the stationary plate of the flexing machine. The flexing plates of the machine shall be at least 6 mm (¼ in.) larger on each side than the specimen being tested. In case the product has one side cored or honeycombed, allow that face to rest on the perforated plate. Adjust the plate positions so that the loading plate is brought just into contact with any part of the specimen. Take the distance between the two plates as the original thickness of the specimen. For products having an indentation value of less than 300 N, the amplitude of compression and decompression shall be 50 % of the original thickness. For products having an indentation value higher than 300 N (67 lbf), the amplitude shall be 25 % of the original thickness. Start the machine reciprocating at 1 Hz and record the total number of flexures continuously by means of a counter. Failure of the specimen is evidenced by physical breakdown of the cellular structure as determined by visual examination and comparison with unflexed specimens. Specimens may be evaluated as agreed upon by the manufacturer and the purchaser after flexing them 250 000 cycles, and calculated as shown in Section 19.

LOW-TEMPERATURE TEST (SUFFIX F1, − 40°C (−40°F); SUFFIX F2, − 55°C (−67°F))

27. Apparatus

27.1 The apparatus shall consist of two parallel plates at least 38 mm (1.5 in.) in diameter, one of which is movable and the other one stationary, a means of applying a load, and a means of accurately measuring the distance between the parallel plates.

28. Test Specimens

28.1 Cylinders 29 mm (1.129 in.) in diameter shall be used for this test. The minimum thickness shall be 19 mm (¾ in.). The thickness shall be measured and recorded. Specimens shall be dried in a desiccator for not less than 16 h before testing.

29. Test Methods

29.1 Measure the compression-deflection of the specimen at room temperature and record the force in newton per square metre (pounds per square inch) necessary to obtain a 25 % deflection. Place the specimen in the cold box for 5 h at the specified temperature, at the end of which time apply the previously determined loads as rapidly as possible while the specimen is still in the cold box. Record the deflection 30 s later.

30. Calculation

30.1 Calculate the percentage changes in deflection as follows:

$$C = [(D - E)/D] \times 100 \quad (3)$$

where:

C = percentage change in deflection,
D = deflection at room temperature, and
E = deflection at temperature of test.

STATIC FATIGUE TEST

31. Test Methods

31.1 *Slab Stock*—Bend a specimen of latex foam 100 by 230 mm (4 by 9 in.) parallel to the 100-mm (4-in.) dimension to an angle of 180° between two compression plates and place in a circulating air oven at 70°C (158°F) for 22 h. The opening between the two plates should be equal to twice the thickness of the unfolded specimen. The folded edge of the specimen should not extend beyond the edge of the compression plates.

31.2 *Cored Stock*—Test the specimen of cored stock as in 31.1, except that the specimens shall be 100 mm (4 in.) wide and the length shall be approximately three times the thickness. Fold out the skin side, if present, for testing.

32. Keywords

32.1 flexible cellular materials; latex foam; specification

SUMMARY OF CHANGES

This section identifies the location of selected changes to these specifications. For the convenience of the user, Committee D20 has highlighted those changes that may impact the use of these specifications. This section may also include descriptions of the changes or reasons for the changes, or both.

D 1055-97:

(*1*) Added Keywords.

(*2*) Changed reference to Geer oven in Static Fatigue Test.

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