



Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials¹

This standard is issued under the fixed designation D 2859; 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 fire-test-response standard describes a test method for the determination of the flammability of finished textile floor covering materials when exposed to an ignition source under controlled laboratory conditions.

1.2 This test method is applicable to all types of textile floor coverings, regardless of the method of fabrication or whether they are made from natural or man-made fibers. It is possible to apply this test method to unfinished material; however, the results of such a test shall not be considered a satisfactory evaluation of a textile floor covering material for ultimate consumer use.

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

1.4 *This standard is used to measure and describe the response of materials, products, or assemblies to heat and flame under controlled conditions, but does not by itself incorporate all factors required for fire hazard or fire risk assessment of the materials, products, or assemblies under actual fire conditions.*

1.5 Fire testing of products and materials is inherently hazardous, and adequate safeguards for personnel and property shall be employed in conducting these tests

1.6 The text of this standard references notes and footnotes which provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of the standard.

1.7 *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:²

¹ This test method is under the jurisdiction of ASTM Committee E05 on Fire Standards and is direct responsibility of Subcommittee E05.22 on Surface Burning.

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² 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.

C 1186 Specification for Flat Non-Asbestos Fiber-Cement Sheets

D 123 Terminology Relating to Textiles

D 1776 Practice for Conditioning and Testing Textiles

D 5684 Terminology Relating to Pile Floor Covering

E 136 Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C

E 176 Terminology of Fire Standards

2.2 AATCC Standard:

Method 138-1972, Shampooing: Washing of Textile Floor Coverings³

2.3 U.S. Consumer Product Safety Commission:⁴

16 CFR Part 1630 Standard for the surface flammability of carpets and rugs (FF 1-70)

16 CFR Part 1631 Standard for the surface flammability of small carpets and rugs (FF 2-70)

3. Terminology

3.1 Definitions:

3.1.1 For definitions of terms contained in this test method associated with fire issues refer to Terminology E 176. For definitions of terms contained in this test method and associated with textile issues refer to Terminology D 123. For definitions of terms contained in this test method and associated with pile floor covering issues refer to Terminology D 5684.

3.1.2 *flame retardant, n*—a chemical used to impart flame resistance.

3.1.3 *flame-retardant treatment, n*—a process for incorporating or adding flame retardant(s) to a material or product.

3.1.3.1 *Discussion*—The term “flame-retardant treatment” does not apply to textiles that are inherently-flame-resistant due to the intrinsic properties of the material or the fiber-forming polymer.

³ Technical Manual of the American Association of Textile Chemists and Colorists, P. O. Box 12215, Research Triangle Park, NC 27709.

⁴ Can be found in Title 16, Volume 2 of the Code of Federal Regulations. Available from U.S. Government Printing Office Superintendent of Documents, 732 N. Capitol St., NW, Mail Stop: SDE, Washington, DC 20401.

3.1.4 *flame resistance, n*—the property of a material whereby flaming combustion is prevented, terminated, or inhibited following application of a flaming or nonflaming source of ignition, with or without subsequent removal of the ignition source.

3.1.4.1 *Discussion*—Flame resistance can be an inherent property of the basic material or product, or it may be imparted by specific treatment. The degree of flame resistance exhibited by a specific material during testing may vary with different test conditions.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *finished, adj*—in textile floor covering materials, the completion of all manufacturing operations.

3.2.2 *flammability, n*—the capability of burning with a flame under specified conditions (see Terminology E 176 for additional discussion of the term flammable.)

4. Summary of Test Method

4.1 This test method involves the exposure of conditioned and oven-dried specimens to a standard source of ignition in a draft-protected environment and the measurement of the resulting char length.

5. Significance and Use

5.1 This test method provides a procedure for identification of those finished textile floor covering materials that can be rated as flame-resistant under specific controlled laboratory conditions.

5.2 This test method does not specify the use of an underlay material. If an underlay material is used to assess the effect of a specific underlay in combination with a specific floor covering, such a variation in procedure must be noted in the report.

5.3 In this test, results are observed with the specimens in a horizontal plane. Different results are possible if the same material is tested or used in any other plane.

5.4 Test Method D 2859 for testing finished textile floor covering materials for flammability is considered satisfactory for acceptance testing of commercial shipments since the method has been used extensively in the trade for acceptance testing. In cases of disagreement arising from differences in values reported by the purchaser and the seller when using this method for acceptance testing, the statistical bias, if any, between the laboratory of the purchaser and the laboratory of the seller shall be determined with each comparison being based on testing specimens randomly drawn from one sample of material of the type being evaluated.

5.5 The test procedures of this standard are part of the standards for the surface flammability of carpets and rugs of the U.S. Consumer Product Safety Commission⁴. The acceptance criterion of these standards requires that at least seven out of eight individual specimens of a given carpet or rug have passed the test, that is, the charred portion of a tested specimen shall not extend to within 25.4 mm [1.0 in.] of the edge of the hole in the flattening frame at any point.

6. Apparatus and Reagent

6.1 *Test Chamber*—A box with inside dimensions of 300 by 300 by 300 mm [12 by 12 by 12 in.] made from reinforced

cement board not less than 6 mm [0.25 in.] thick, open at the top, and having a flat removable floor made of the same material. The reinforced cement board shall be uncoated, have a density of $1444 \pm 160 \text{ kg/m}^3$ [$90 \pm 10 \text{ lb/ft}^3$] and comply with Specification C 1186 and with Test Method E 136.

6.2 *Frame*—A steel plate, 230 by 230 mm [9 by 9 in.], 6 mm [0.25 in.] thick, with a $200 \pm 5\text{-mm}$ [8-in.] diameter hole cut in the center of the plate.

6.3 *Desiccating Cabinet*, with an efficient desiccant, and shelves large enough to hold 230 by 230-mm [9 by 9-in.] specimens spaced separately in a horizontal position.

6.4 *Circulating Air Oven*, ventilated, forced-draft and thermostatically controlled in the atmosphere range of $105 \pm 2^\circ\text{C}$ [$221 \pm 4^\circ\text{F}$] throughout the enclosure.

6.5 *Glove*, disposable, of polyethylene or rubber.

6.6 *Steel Rule*, graduated in 0.5-mm [0.02-in.] increments.

6.7 *Vacuum Cleaner*, of which all surfaces contacting the specimens are flat and smooth.

6.8 *Laboratory Fume Hood*, capable of being closed and having its draft turned off during each test. Hood construction shall permit observation of the test in progress. Hoods with transparent front or sides allow such observations while the hood door is closed.

6.9 *Methenamine Tablet*.⁵

NOTE 1—Storage of the tablets in a desiccator will reduce cracking upon ignition.

NOTE 2—The normal variation in the weight of different tablets will not affect the test result.

7. Sampling, Selection, and Number of Test Specimens

7.1 Take a lot sample as directed by the applicable material specification. In the absence of an applicable material specification or other agreement between the purchaser and the seller, select a sample comprised of a roll or piece believed to be representative of the lot to be tested. Each roll or piece must be large enough to permit cutting eight specimens each 230 mm [9 in.] square, free of creases, fold marks, or any delamination.

7.2 If the textile floor covering material has had a fire-retardant treatment, wash the specimens as directed in the washing procedure described in AATCC Method 138-1972.

7.3 Cut eight specimens, each 230 mm [9.0 in.] square, from each sample.

8. Preconditioning

8.1 Precondition the specimens in a conditioning room or chamber at a relative humidity of $65 \pm 2\%$ and at a temperature of $21 \pm 1^\circ\text{C}$ [$70 \pm 2^\circ\text{F}$].

8.1.1 Keep the specimens in the conditioning room or chamber until the material has attained moisture equilibrium for testing. For moisture equilibrium, a change of less than 0.1 % of the specimen mass after a 2-h exposure is satisfactory.

NOTE 3—Practice D 1776 discusses the conditioning of textiles for testing.

⁵ Methenamine Reagent Tablet #1588 (0.149-g weight), Eli Lilly Inc., 307 East McCarty St., Indianapolis, IN 46206, has been found satisfactory.

9. Procedure

9.1 Clean each specimen with the vacuum cleaner until it is free of all loose ends and of any material worked into the pile during handling. Exercise care to avoid “fuzzing” of the pile yarn.

9.2 Place the eight conditioned specimens in an oven in a manner that will permit free circulation of the air at $105 \pm 2^\circ\text{C}$ [$221 \pm 4^\circ\text{F}$] for 2 h.

NOTE 4—Conditioning prior to the drying operation is specified because storage conditions may cause some material to be moist, thus requiring considerably more than 2 h drying time.

NOTE 5—Multiple test samples can be dried concurrently.

9.3 Remove the eight specimens from the oven with a gloved hand and immediately place them in a desiccator for 1 h, or until they reach room temperature, whichever is longer, making sure that the specimens are in a horizontal plane with the pile side up, and that they are not resting on one another.

NOTE 6—Specimens taken from some carpet types may become distorted after drying, such that they curl at the edges. Such distortion can be corrected by rolling the affected edges in a direction opposite to the curl prior to placing in the desiccator.

9.4 Place the test chamber in the laboratory fume hood with all exhaust turned off.

9.5 Remove a test specimen from the desiccator and with a gloved hand brush the pile into an upright position as nearly vertical as possible. Place the specimen on the floor of the test chamber with the pile side up, exercising care that the specimen is in a horizontal plane, then place the steel frame on top of the specimen, and line up the outside edges of the specimen and the frame.

9.6 Place a methenamine tablet flat, and in the center of the specimen, and ignite the tablet by touching a lighted match carefully to the top of the tablet. Do not contact the surface of the specimen with the lighted match. If more than 2 min elapses between removal of the specimen from the desiccator and ignition of the tablet, repeat the oven drying procedure as directed in 9.2 and 9.3. Close the hood door as needed to provide a draft-protected environment for the test. Assure adequate draft-protected air supply for combustion.

NOTE 7—Draft-protected environment is indicated by an undisturbed vertical smoke plume above the surface of the specimen.

NOTE 8—If the tablet cracks upon ignition, discard the specimen.

9.7 Allow the ignition flame and any propagated flame to burn out or burn until the flame or glowing reaches any point along the edge of the hole in the steel frame. Terminate the test on each specimen when either of the above conditions is reached.

9.8 After each specimen has been tested, remove the floor from the chamber and free it of any residue that would prevent the next specimen from lying in a horizontal plane. Allow sufficient time between tests for the chamber to cool to room temperature. Test the remaining seven specimens in the same way.

NOTE 9—Testing can be expedited by providing several interchangeable floor pieces.

10. Interpretation of Results

10.1 A single specimen has passed the test if the charred portion of the tested specimen shall not extend to within 25 ± 0.5 mm [1.0 in.] of the edge of the hole in the steel frame at any point.

11. Report

11.1 State that the specimens were tested as directed in Test Method D 2859. Describe the material or product sampled and the method of sampling used.

11.2 Report the number of specimens out of the eight tested that passed the test.

12. Precision and Bias

12.1 *Precision*—It is not possible to specify the precision of the procedures in Test Method D 2859 for measuring ignition characteristics of finish textile floor covering materials since there is no standard reference to evaluate the precision of the pass/fail criterion. The only reportable result specified in the standard is whether the charred portion of the test specimen extends within 25.4 mm [1.0 in.] of the edge of the hole in the steel frame at any point. There are no requirements for quantitative measurement of the charred portion of the test specimen.

12.2 *Bias*—No justifiable statement on bias of Test Method D 2859 for the flammability of finished textile floor covering materials can be made, since the true value cannot be established by an accepted referee method.

13. Keywords

13.1 carpet; ignition; pile floor coverings

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