Designation: D2859 – 16 (Reapproved 2021)

An American National Standard

Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials[1]

This standard is issued under the fixed designation D2859; 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 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.

1.1.1 Carpets and rugs offered for sale in the United States are required by the Consumer Product Safety Commission (CPSC) to comply with the test methods in 16 CFR 1630 or 16 CFR 1631, as appropriate.

1.1.2 This test method is similar but not identical to the test methods contained in 16 CFR 1630 and CFR 1631 and issued by CPSC. If compliance with one of the CPSC test methods is required, this test method does not ensure regulatory compliance.

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 standard. The values given in parentheses after SI units are provided for information only and are not considered standard.

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

1.8 *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:*[2]

C1186 Specification for Flat Fiber-Cement Sheets

D123 Terminology Relating to Textiles

D1776 Practice for Conditioning and Testing Textiles

D5684 Terminology Relating to Pile Floor Coverings

E176 Terminology of Fire Standards

2.2 *AATCC Standard:*

Method 138-2014, Shampooing: Washing of Textile Floor Coverings[3]

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)

[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.

[3] Technical Manual of the American Association of Textile Chemists and Colorists (AATCC), P.O. Box 12215, Research Triangle Park, NC 27709, http://www.aatcc.org.

[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.

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

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of terms contained in this test method associated with fire issues refer to Terminology E176. For definitions of terms contained in this test method and associated with textile issues refer to Terminology D123. For definitions of terms contained in this test method and associated with pile floor covering issues refer to Terminology D5684.

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 E176 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 D2859 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 similar but not identical to those contained in the standards for the surface flammability of carpets and rugs of the U.S. Consumer Product Safety Commission[4] (see also 1.1). The acceptance criterion of these CPSC standards requires that at least seven out of eight individual specimens of a given carpet or rug have passed the test, that is, that 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.

5.6 The acceptance criterion of this test method is consistent with that of CPSC standards (see Section 10).

6. Apparatus and Reagent

6.1 *Test Chamber*—The test chamber shall consist of a box with nominal inside dimensions of 300 by 300 by 300 mm (12 by 12 by 12 in.) made from fiber cement board not less than nominally 6 mm (0.25 in.) thick, open at the top, and having a flat removable floor made of the same material. The fiber cement board shall be uncoated, have a density of 1444 ± 160 kg/m^3 (90 ± 10 lb/ft^3) and comply with the requirements of Specification C1186 Grade II. The sides shall be fastened together and sealed to prevent air leakage into the box during use.

6.2 *Frame*—The flattening frame shall be a steel plate, nominally 230 by 230 mm (9 by 9 in.), nominally 6 mm (0.25 in.) thick, with a nominal 200 ± 5-mm (8-in.) diameter hole cut in the center of the plate.

6.3 *Desiccating Cabinet*—A desiccating cabinet shall be provided, containing silica gel or an alternate desiccant. The desiccating cabinet shall have shelves large enough to hold a set of eight specimens horizontally without contacting each other during a cooling period following specimen drying.

6.4 *Circulating Air Oven*—A forced circulation drying oven shall be provided, for removal of moisture from the specimens, capable of being thermostatically controlled and maintained at 105 ± 2 °C (221 ± 4 °F) throughout the enclosure.

6.5 *Glove*—Non hygroscopic disposable gloves shall be provided for handling the specimens after drying. The gloves shall be made of polyethylene or rubber.

6.6 *Steel Rule*—A steel rule, graduated in 0.5-mm (0.02-in.) increments shall be provided.

6.7 *Vacuum Cleaner*—A vacuum cleaner shall be used to remove all loose material from each specimen prior to conditioning. All surfaces of the vacuum cleaner contacting the specimens shall be flat and smooth and maintained in a clean condition.

6.8 *Laboratory Fume Hood*—The apparatus shall be placed in a laboratory fume hood capable of providing a draft-free environment during the test for the test chamber described in 6.1. The hood shall permit the observation of the test in progress, and the removal of the products of combustion following each test.

6.9 *Mirror*—Optionally, a small mirror shall be provided, mounted above each test chamber at an angle to permit observation of the specimen from outside of the hood.

6.10 *Ignition Source*—The ignition source shall be a timed methenamine burning tablet (pill), with the following specifications.

6.10.1 The pill shall be a flat, round, compressed tablet of essentially pure methenamine, with a weight of 150 ± 5 mg, a nominal diameter of 6 mm (0.25 in.) and a nominal heat of combustion of 7,180 calories per gram.

NOTE 1—The duration of the flaming when the tablet, alone, is tested on a metal plate under standard draft-free conditions is approximately 130 s.

6.10.2 Tablets shall be stored for at least 24 h in a desiccator over a desiccant.

NOTE 2—Storage of the tablets in a desiccator will reduce cracking upon ignition.

6.11 *Timed Methenamine burning tablet (pill).*

6.11.1 Specifications for the round, beveled, compressed tablet are:

6.11.1.1 Weight of 149 ± 5 mg.

6.11.1.2 Nominal diameter of 6.35 mm (0.25 in.).

6.11.1.3 Approximate burning time of tablet alone is 130 s.

6.11.2 Burning time of the tablet alone is the duration of the flaming when the tablet is tested on a metal burn plate under standard conditions of draft-free environment.

6.11.3 Tablets shall be stored in a desiccator over a desiccant.

NOTE 3—Storage of the tablets in a desiccator will reduce cracking upon ignition.

7. Sampling, Selection, and Number of Test Specimens

7.1 Select a sample of the material representative of the lot 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 nominally 230 mm (9 in.) square, free of creases, fold marks, or any delamination or other distortions.

7.2 If the textile floor covering material has had a fire-retardant treatment, or is made of fibers which have had a fire-retardant treatment, wash the specimens as directed in the washing procedure described in AATCC Method 138-2014 or by using an alternate washing procedure acceptable to the authority having jurisdiction.

7.2.1 If the backing system of the carpet has been fire retarded by using alumina trihydrate (ATH), the washing procedure in 7.2 is not required.

7.3 Cut eight test specimens, each nominally 230 mm (9.0 in.) square, from each sample.

8. Test Specimen Preparation

8.1 *Cleaning*—Clean each test specimen with the vacuum cleaner (or other means) 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.

8.2 *Examination of Test Specimens for Moisture*—Examine the test specimens. If they appear visibly moist, perform preconditioning in accordance with 8.7 before drying.

8.3 *Weighing*—Weigh each test specimen, to an accuracy of not less than ±1 g, before drying and record the weight.

8.4 *Drying*—Place the eight test specimens in an oven in a manner that will permit free circulation of the air at 105 ± 2 °C (221 ± 4 °C) for 2 h.

NOTE 4—Multiple test specimens can be dried concurrently.

8.5 *Cooling*—Remove the eight test 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 test specimens are in a horizontal plane with the pile side up, and that they are not resting on one another.

NOTE 5—Test specimens taken from some carpet types have the potential to 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.

8.6 *Assessment of Test Specimen Dryness*—Weigh one of the eight test specimens that have undergone drying and compare with the initial weight. If the specimen has lost at least 20 % of its initial weight, it was excessively moist and all eight test specimens shall be preconditioned in accordance with 8.7 before undergoing another oven drying in accordance with 8.4.

8.6.1 The assessment in 8.6 is not conducted for test specimens that have undergone preconditioning.

8.7 *Preconditioning*—Precondition the test specimens in a conditioning room or chamber in accordance with Practice D1776.

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

NOTE 6—Preconditioning prior to the drying operation addresses the fact that, in some cases, storage has the potential to cause some materials to be moist, thus requiring over 2 h drying time.

9. Procedure

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

9.2 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 test specimen on the floor of the test chamber with the pile side up, exercising care that the test specimen is in a horizontal plane, then place the steel frame on top of the test specimen, and line up the outside edges of the test specimen and the frame.

9.3 Place a methenamine tablet flat, in the center of the test specimen, and ignite the tablet by touching a flame carefully to the top of the tablet. Do not contact the surface of the test specimen with the flame.

9.3.1 If the tablet cracks upon ignition, discard the test specimen.

9.4 If more than 2 min elapses between removal of the test specimen from the desiccator and ignition of the tablet, repeat the oven drying procedure as directed in 8.3 and 8.4. Close the hood door, while the draft in the hood is off, as needed to provide a draft-protected environment for the test. Ensure adequate air supply for combustion.

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

9.5 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.