



Standard Test Method for Flammability of Apparel Textiles¹

This standard is issued under the fixed designation D 1230; 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 test method covers the evaluation of the flammability of textile fabrics as they reach the consumer for or from apparel other than children's sleepwear or protective clothing.

1.2 *This standard should be used to measure and describe the properties of materials, products, or assemblies in response to heat and flame under controlled laboratory conditions and should not be used to describe or appraise the fire hazard or fire risk of materials, products, or assemblies under actual fire conditions. However, results of this test may be used as elements of a fire-risk assessment which takes into account all of the factors which are pertinent to an assessment of the fire hazard of a particular end use.*

NOTE 1—This test method is *not* identical to 16 CFR Part 1610, Flammability of Clothing Textiles. Consumer Product Safety Commission regulations require that fabrics introduced into commerce meet the requirements of 16 CFR Part 1610.

1.3 *This standard does not purport to address all of the safety problems, 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.* Specific precautionary information is found in 9.2.1.3.

1.4 The values stated in SI units are to be regarded as the standard; inch-pound units are provided for information only.

2. Referenced Documents

2.1 ASTM Standards:

D 123 Terminology Relating to Textiles²

D 484 Specification of Hydrocarbon Drycleaning Solvents³

D 2724 Test Methods for Bonded, Fused, and Laminated Apparel Fabrics²

E 122 Practice for Choice of Sample Size to Estimate a Measure of Quality for Lot or Process⁴

2.2 AATCC Test Method:

135 Dimensional Changes in Automatic Home Laundering

of Durable Press Woven or Knit Fabrics⁵

3. Terminology

3.1 Definitions:

3.1.1 *combustible textile, n*—a textile that will ignite and burn or that will give off vapors that ignite and burn when subjected to external sources of ignition.

3.1.2 *flame spread, n*—the propagation of a flame away from the source of ignition.

3.1.3 *flame-spread time, n*—the time taken by a flame on a burning material to travel a specified distance under specified conditions.

3.1.4 *flammability, n*—those characteristics of a material that pertain to its relative ease of ignition and relative ability to sustain combustion.

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

3.1.6 *flame-retardant-treated, adj*—having received a flame-retardant treatment.

3.1.6.1 The term “flame-retardant-treated” does not apply to textiles that are inherently flame resistant due to the intrinsic properties of the material or the fiber-forming polymer.

3.1.7 *interlining, n*—any textile which is intended for incorporation into an article of wearing apparel as a layer between an outer shell and an inner lining.

3.1.8 *raised fiber surface, n*—in textile fabrics, intentionally lifted fibers or yarns such as pile, napped, tufted, flocked, or similar surfaces.

3.2 For definitions of other terms used in this test method, refer to Terminology D 123 and to the *Technical Manual of the American Association of Textile Chemists and Colorists*.

4. Summary of Test Method

4.1 The standard provides methods of testing the flammability of textiles from or intended to be used for apparel, explains three classes of flammability, sets forth the requirements for classifying textiles, and warns against the use of single or multilayer textile fabrics that have burning characteristics considered by the trade to make them unsuitable for apparel.

4.2 Specimens cut from the textile are prepared by brushing if they have a raised fiber surface, by drycleaning and laundering if they have been flame-retardant-treated. A dried

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² *Annual Book of ASTM Standards*, Vol 07.01.

³ Discontinued—See 1983 *Annual Book of ASTM Standards*, Vol 06.03.

⁴ *Annual Book of ASTM Standards*, Vol 14.02.

⁵ Available from the American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, NC 27709.

specimen is inserted in a frame and held in a special apparatus at an angle of 45°, a standardized flame is applied to the surface near the lower end for 1 s, and the time required for the flame to proceed up the fabric a distance of 127 mm (5 in.) is recorded. Notation is made as to whether the base of a raised-surface fabric ignites, chars, or melts.

5. Uses and Significance

5.1 Test Method D 1230 for the determination of the flammability of apparel textiles cannot be recommended for the acceptance testing of commercial shipments since Federal regulations require apparel fabrics to meet the criteria of 16 CFR 1610 and correlation of test results with actual performance has not been established. Although Test Method D 1230 is not recommended for acceptance testing, it is useful because it provides a less expensive and time consuming research tool than 16 CFR 1610. Also, since the Consumer Product Safety Commission is presently considering action to allow alternate test methods to 16 CFR 1610, and has shown a willingness to consider changes to it, Test Method D 1230 should serve as the industry standard and as a guide for needed changes to federal regulations. See 1.2 and Note 1.

5.1.1 In case of a dispute arising from differences in reported test results when using Test Method D 1230 for acceptance testing of commercial shipments, the purchaser and the supplier should conduct comparative tests to determine if there is a statistical bias between their laboratories. Competent statistical assistance is recommended for the investigation of bias. As a minimum, the two parties should take a group of test specimens which are as homogeneous as possible and which are from a lot of material of the type in question. The test specimens should then be randomly assigned in equal numbers to each laboratory for testing. The average results from the two laboratories should be compared using a nonparametric test for unpaired data and an acceptable probability level chosen by the two parties before testing is begun. If a bias is found, either its cause must be found and corrected or the purchaser and the supplier must agree to interpret future test results in light of the known bias.

5.2 All fabrics made of natural or regenerated cellulose, as well as many made from other natural or man-made fibers, are combustible. Some combustible fabrics when used for clothing are potentially dangerous to the wearer because of such factors as ease of ignition, flame spread time, amount of heat released, and design of the garment. This test measures two such factors: ease of ignition and flame spread time.

5.3 In order to place fabrics in one of the three flammability classes, arbitrary limits have been selected for time of application of the flame and for time of flame spread. These limits are based on extensive testing experience and are believed to be a useful guide in judging the relative flammability of apparel textiles. It must be understood, however, that no guarantee can be given and none is implied that garments made from a fabric or product falling into any one of the flammability classes will not be hazardous under some conditions.

5.3.1 Because of the sensitivity of fabrics to ambient atmospheric conditions, technique of specimen preparation, and inherent variability in the cloth itself, test results are not always

closely reproducible either in the same laboratory or among several laboratories.

5.4 Finishes and fabric surface changes can exert a large effect on flammability. Therefore, some fabrics are tested before as well as after laundering or drycleaning or both (see Section 9).

5.5 This standard is not applicable to hats, gloves, footwear, or interlining fabrics.

6. Apparatus and Materials

6.1 *Flammability Tester*⁶, with a separate timer capable of providing flame impingement on the specimen for 1 + 0.05 s as shown in Fig. 1 or an equivalent electrically operated tester equipped with an automatic electric timer, as described in Annex A1. Testers are normally supplied with specimen holders.

6.2 *Brushing Device*⁶, as shown in Fig. 2, and described in Annex A1.

6.3 *Drycleaning Machine*—Single unit, coin-operated type capable of providing a complete automatic dry-to-dry cycle using perchlorethylene (see 6.1 of Test Methods D 2724).

6.4 *Laboratory Drying Oven*.

6.5 *Desiccator*, 250 mm (10 in.) diameter.

6.6 *Calcium Chloride*, anhydrous.

6.7 *Butane*, CP.⁷

6.8 *AATCC Standard Detergent 124*.⁵

6.9 *Perchlorethylene*, commercial grade.

6.10 *Drycleaning Detergent*⁸, amine sulfonate type.

6.11 *Cotton Sewing Thread*, No. 50, mercerized.

7. Sampling

7.1 *Lot Sample*—As a lot sample for testing, take at random the number of primary sampling units directed in an applicable material specification or other agreement between the purchaser and the supplier. For fabric, consider rolls of fabric to be the primary sampling units. For garments, consider shipping cartons to be the primary sampling units.

NOTE 2—A realistic specification or other agreement between the purchaser and the supplier requires taking into account the variability between primary sampling units and within primary sampling units so as to provide a sampling plan which has a meaningful producer's risk, consumer's risk, acceptable quality level, and limiting quality level. A lot sample normally consists of a very small fraction of the total primary sampling units.

7.2 *Laboratory Sample*—As a laboratory sample for testing, proceed as follows:

7.2.1 For fabric take a full-width swatch ½ m (½ yd) long from the end of each roll of fabric in the lot sample, after first discarding any fabric from the very outside of the roll that contains folds, creases, or any evidence of displaced weave.

⁶ The Flammability Tester and Brushing Device can be obtained from U.S. Testing Co., Inc., 1415 Park Ave., Hoboken, NJ 07030; Custom Scientific Instruments, Inc., 13 Wing Drive, Whippany, NJ 07981; and The Govmark Organization, Inc., P.O. Box 807, Bellmore, NY 11710.

⁷ Butane, cp. No. 4 cylinders, containing 2 lb may be obtained from Matheson Co., Inc., East Rutherford, NJ.

⁸ Staticol, amine sulfonate type, available from R. R. Street, Inc., 561 W. Monroe St., Chicago, IL; or Perksheen 324, amine sulfonate type, available from Adco, Inc., 900 W. Main St., Sedalia MO, have been found suitable for this purpose.



FIG. 1 Flammability Tester

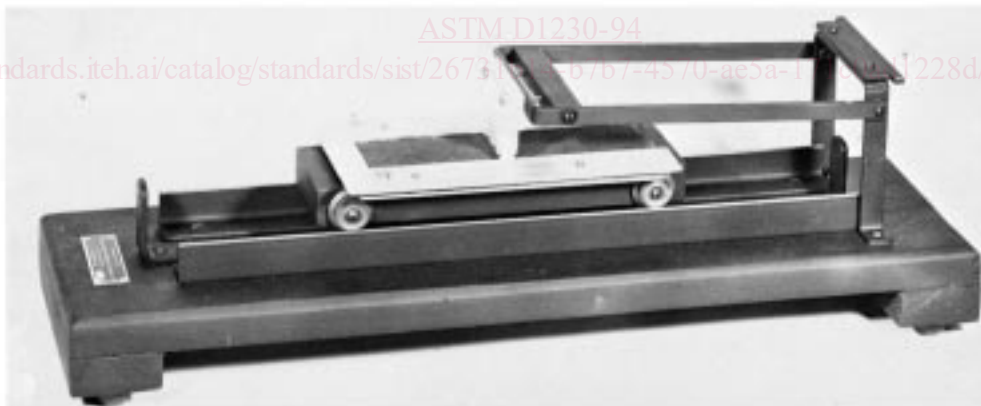


FIG. 2 Brushing Device

7.2.2 For garments, take the number of garments per shipping carton in the lot sample directed in an applicable material specification or other agreement between the purchaser and supplier.

7.3 Test Specimens:

7.3.1 Use exploratory tests as directed in 8.2 to select the orientation of specimens, the face of the fabric to be tested, and the part of any pattern to be tested so as to maximize the rate of flame spread.

7.3.2 For fabric, cut final test specimens from each swatch

in the laboratory sample as directed in 9.1. For fabrics that can be refurbished, cut additional final test specimens from each swatch in the lot sample after the swatches have been refurbished as directed in 9.2. Identify the specimens as coming from a swatch before or after refurbishing.

7.3.3 For garments, cut final test specimens from each garment in the laboratory sample as directed in 9.1. For garments that can be refurbished, cut additional final test specimens from each garment in the lot sample after the garments have been refurbished as directed in 9.2. Identify the