



Designation: D 3597 – 95a

## Standard Specification for Woven Upholstery Fabrics—Plain, Tufted, or Flocked<sup>1</sup>

This standard is issued under the fixed designation D 3597; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This specification covers the performance requirements for plain, tufted, or flocked woven upholstery fabrics as used in the manufacture of new indoor furniture. These requirements apply to both the warp and filling directions for those factors where each fabric direction is pertinent.

1.2 This specification is not applicable to fabrics used in porch, deck, or lawn furniture; nor for knitted fabrics, bonded or laminated fabrics, or surface-coated fabrics (such as vinyls and urethanes).

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.*

### 2. Referenced Documents

#### 2.1 ASTM Standards:

- D 123 Terminology Relating to Textiles<sup>2</sup>
- D 434 Test Method for Resistance to Slippage of Yarns in Woven Fabrics Using a Standard Seam<sup>2</sup>
- D 1175 Method of Abrasion Resistance of Textile Fabrics (Oscillatory Cylinder and Uniform Abrasion)<sup>3</sup>
- D 1424 Test Method for Tear Resistance of Woven Fabrics by Falling-Pendulum (Elmendorf) Apparatus<sup>2</sup>
- D 2262 Test Method for Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant-Rate-of-Traverse Tensile Testing Machine)<sup>2</sup>
- D 2905 Practice for Statements on Number of Specimens for Textiles<sup>2</sup>
- D 5034 Test Method for Breaking Force and Elongation of Textile Fabrics (Grab Test)<sup>4</sup>

#### 2.2 AATCC Test Methods:<sup>5</sup>

- 8 Colorfastness to Crocking: Crockmeter Method

- 16 Colorfastness to Light
- 23 Colorfastness to Burnt Gas Fumes
- 107 Colorfastness to Water
- 116 Colorfastness to Crocking: Rotary Vertical Crockmeter Method<sup>5</sup>
- 129 Colorfastness to Ozone in the Atmosphere Under High Humidities
- Gray Scale for Color Change, Evaluation Procedure 1
- Chromatic Transference Scale, Evaluation Procedure 3
- Specifications Standards Test Procedures for Upholstered Furniture Fabrics<sup>6</sup>
- Guides for the Household Furniture Industry<sup>7</sup>
- 2.3 *Federal Standard:* 16CFR, Chapter II—Consumer Product Safety Commission, Subchapter D—Flammable Fabrics Act Regulation<sup>8</sup>
- 2.4 *Military Standard:* MIL-STD-105D Sampling Procedures and Tables for Inspection by Attributes<sup>9</sup>

NOTE 1—Reference to test methods in this standard give only the permanent part of the designation of ASTM, AATCC, or other test methods. The current editions of each test method cited shall prevail.

### 3. Terminology

3.1 For definitions of textile terms used in this specification, refer to Terminology D 123. Definitions found in a dictionary of common terms are suitable for terms used in this specification.

### 4. Significance and Use

4.1 Upon mutual agreement between the purchaser and the supplier, woven fabrics intended for this end use should meet all of the requirements listed in Table 1 of this specification.

4.2 It is recognized that for purposes of fashion or aesthetics the ultimate consumer of articles made from these fabrics may find acceptable fabrics that do not conform to all of the requirements in Table 1. Therefore, one or more of the requirements listed in Table 1 may be modified by mutual

<sup>1</sup> This specification is under the jurisdiction of ASTM committee D-13 on Textiles, and is the direct responsibility of Subcommittee D13.56 on Performance Standards for Textile Fabrics.

Current edition approved Dec. 10, 1995. Published March 1996. Originally published as D 3597 – 77. Last previous edition D 3597 – 95.

<sup>2</sup> *Annual Book of ASTM Standards*, Vol 07.01.

<sup>3</sup> Discontinued—Replaced by D 4157 and D 4158 in *Annual Book of ASTM Standards*, Vol 07.01.

<sup>4</sup> *Annual Book of ASTM Standards*, Vol 07.02.

<sup>5</sup> AATCC Technical Manual, available from the American Association of Textile Chemists and Colorists, P. O. Box 12215, Research Triangle Park, NC 27709.

<sup>6</sup> Issued in 1969 by the National Association of Furniture Manufacturers and the National Retail Furniture Association. Available from Home Furniture Manufacturers Assn., P. O. Box HP-7, High Point, NC 27261.

<sup>7</sup> Available from the Bureau of Consumer Protection, Federal Trade Commission, Washington, DC 20580.

<sup>8</sup> Available from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

<sup>9</sup> Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

**TABLE 1 Specification Requirements**

Characteristics	Requirements	Section
Breaking strength (load)	222 N (50 lbf), min	7.1
Tongue tear strength	27 N (6 lbf), min	7.2
Resistance to yarn slippage	111 N (25 lbf), min	7.3
Surface abrasion <sup>A</sup>		
Light-duty	3000 cycles (double rubs), min	7.4
Medium-duty	9000 cycles (double rubs), min	7.4
Heavy-duty	15,000 cycles (double rubs), min	7.4
Dimensional change:		
Warp or filling	5.0% shrinkage, max to 2.0% gain, max	7.5
Colorfastness to: <sup>B</sup>		
Water, <sup>C</sup> Color Change	class 4, <sup>D</sup> min	7.6
Solvent, <sup>C</sup> Color Change	class 4, <sup>D</sup> min	7.7
Burnt gas fumes-2 cycles	class 4, <sup>D</sup> min	7.8
Crocking:		
Dry	class 4, <sup>E</sup> min	7.9
Wet	class 3, <sup>E</sup> min	7.9
Light-40 AATCC Fading Units	class 4, <sup>D</sup> min	7.10
Ozone 1 cycle	class 4, <sup>D</sup> min	7.11
Retention of hand, character, and appearance	pass	7.12
Durability of back coating	pass	7.13
Flammability	pass	7.14
FTC Requirements	pass	7.15

<sup>A</sup> For guideline purposes—See Note 4.

<sup>B</sup> Class in the colorfastness requirements is based on a numerical scale of 5 for negligible for no colorchange or color transfer to 1 for very severe color change or color transfer.

<sup>C</sup> For guidelines purposes—See Section 7.6.2.

<sup>D</sup> AATCC Gray Scale for Color Change.

<sup>E</sup> AATCC Chromatic Transference Scale.

agreement between the purchaser and the supplier.

4.2.1 In such cases, any references to the specification shall specify that: This fabric meets ASTM Specification D 3597 except for the following characteristic(s).

4.3 Where no prepurchase agreement has been reached between the purchaser and the supplier, and in case of controversy, the requirements listed in Table 1 are intended to be used as a guide only. As noted in 4.2, ultimate consumer demands dictate varying performance parameters for any particular style of fabric.

4.4 The significance and uses of particular properties and test methods are discussed in the appropriate sections of the specified test methods.

## 5. Sampling

5.1 Tests shall be performed on the fabric as it will reach the consumer.

5.2 Select the lot samples as specified in the applicable test methods. In the absence of such instructions in a specific test method, select the lot sample as agreed by the purchaser and the seller.

5.2.1 *Lot Sample*—As a lot sample for acceptance testing, take at random the number of rolls as directed in an applicable specification of other agreement between the purchaser and the supplier, such as an agreement to use MIL-STD-105D.

5.2.2 *Laboratory Sample*—From each roll or piece in the lot sample, cut two laboratory samples the full width of the fabric and at least 375 mm (15 in.) along the selvage.

5.3 Unless otherwise agreed upon, as when specified in an applicable material specification, take the number of specimens as directed in each of the applicable test methods.

5.3.1 If there has been no prior agreement and the test method does not specify the number of specimens, use the

procedures in Practice D 2905 to determine the number of specimens, such that the user may expect at the 95 % probability level that the test result is no more than 5 % of the average above or below the true average that is, a theoretical average from an infinite number of observations when using a reliable estimate of variability of individual observations on similar materials in the user's laboratory under conditions of single operator precision.

## 6. Specification Requirements

6.1 The properties of woven upholstery fabrics (plain, tufted, or flocked) shall conform to the specification requirements in Table 1.

## 7. Test Methods (See Note 1)

7.1 *Breaking Strength*—Determine the dry breaking force in the standard atmosphere for testing textiles, as directed in Test Method D 5034, using a constant rate of traverse (CRT) tensile testing machine with the speed of the pulling clamp at  $300 \pm 10$  mm ( $12 \pm \frac{1}{2}$  in.)/min.

NOTE 2—If preferred, the use of a constant-rate-of-extension (CRE) tensile testing machine is permitted. The crosshead speed should be as agreed between the purchaser and the supplier. However, in case of controversy the CRT method shall prevail.

7.2 *Tear Strength*—Determine the tear strength in accordance with Test Method D 2262.

NOTE 3—If preferred, use of Test Method D 1424 is permitted with existing requirements as given in this standard. However, in case of controversy, Test Method D 2262 shall prevail.

7.3 *Resistance to Yarn Slippage*:

7.3.1 Determine the resistance to yarn slippage in accordance with Test Method D 434. Regardless of the disclaimer

found in 1.2 of Test Method D 434, this procedure is applicable with the following modifications.

7.3.2 Sew the seam using a minimum of seven and a maximum of eight stitches per inch (320 stitches per metre).

7.3.3 Use a chrome or nickel plated needle, 0.063 in. (1.60 mm) in diameter.<sup>10</sup>

7.3.4 Use a No. 24-4 hard finish “Z” twist white cotton sewing thread<sup>11</sup> as the needle thread. Use either hard or soft finish No. 24-4 “Z” twist white cotton sewing thread for the bobbin thread.

#### 7.4 Surface Abrasion:

7.4.1 Determine the surface abrasion in accordance with Test Method D 1175, using the Oscillatory Cylinder Method with the following modifications.

NOTE 4—The Oscillatory Cylinder Method of Test Method D 1175 is specified due to the historical usage of this method by furniture manufacturers; and one by which they have accumulated much data which, reportedly, has correlated with end-use performance in certain cases. Nonetheless, Section 5 of Test Method D 1175 states that the procedure is not recommended for acceptance testing. Consequently, the test requirements for this performance factor should be used with caution, in the knowledge that different fabrics will not always be ranked by this test in the same order as by actual abrasive wear which takes place on specific pieces of furniture.

7.4.2 Use a clean wire screen abradant, stainless steel, 50 by 70 mesh (210 by 297  $\mu\text{m}$ ), backed by a 14-mesh (1.4 by 1.4 mm) to an 18-mesh (1.0 by 1.0 mm) screen.

7.4.3 The tension of the specimen shall be 4 lbf (18 N) and the compression force shall be 3 lbf (13 N).

7.4.4 Test at least two specimens in the warp direction, and at least two in the filling direction.

7.4.5 At the end of 3000 cycles (double rubs) examine the specimens for loose threads and wear (slight discoloration from the stainless steel screen on light colored fabrics is disregarded). If no noticeable change is apparent, continue the test for another 6000 cycles (a total of 9000 cycles). Examine the specimen again. If no noticeable change is apparent, continue the test for another 6000 cycles (a total of 15,000 cycles).

NOTE 5—Loss of pigment and frosting are considered in evaluating wear. However, other changes in surface appearance or disturbance of the surface character without significant abrasive wear should be disregarded.

7.4.6 Classify fabrics that show no noticeable wear after 3000 cycles but show appreciable wear at 9000 cycles as light-duty. Classify fabrics that show no appreciable wear at 9000 cycles but appreciable wear at 15 000 cycles as medium-duty. Classify fabrics that show no noticeable wear at 15 000 cycles as heavy-duty.

#### 7.5 Dimensional Change:

7.5.1 Determine dimensional change in accordance with Specifications Standards Test Procedures for Upholstered Furniture Fabrics, as follows:

NOTE 6—Test is not relevant if fabric is to be labeled “clean with solvent only.”

##### 7.5.2 Procedure:

<sup>10</sup> Singer No. 23 needle, or its equivalent has been found satisfactory for this method.

<sup>11</sup> Source, most suppliers of upholstery sewing thread.

7.5.2.1 Mark 12 by 12-in. (305 by 305-mm) test specimens with sets of three 10-in. (254-mm) gage distances in both the warp and the filling directions.

7.5.2.2 Place the marked specimens in a pan at least 14 by 14 by 6 in. (356 by 356 by 152 mm) containing a sufficient volume of  $80 \pm 5^\circ\text{F}$  ( $26 \pm 3^\circ\text{C}$ ) distilled or demineralized water to cover them completely in their fully opened flat state. The water should contain 0.05% (OWS) nonionic wetting agent.

7.5.2.3 After being completely submerged in the water for  $10 \pm 1$  min, remove the specimens and individually lay them out flat on horizontal ventilated screens and allow them to dry in the prevailing room atmosphere (approximately 24 h). Do not extract or wring out the specimens prior to drying.

7.5.2.4 After drying, measure the distance between the gage marks in each fabric direction. Separately report the average dimensional change in the warp and the filling.

7.5.3 *Calculations*—Calculate the shrinkage or the gain as directed in Eq 1 and Eq 2;

$$S = [(A - B)/A] \times 100 \quad (1)$$

$$G = [B - A/A] \times 100 \quad (2)$$

where:

$A$  = distance between gage marks before wetout, 10 in. (254 mm),

$B$  = distance between gage marks after wetout and drying.

$G$  = gain, %, and

$S$  = shrinkage, %.

In reporting the gain, the percent change shall have the prefix +.

#### 7.6 Colorfastness to Water:

NOTE 7—Test is not relevant if fabric is to be labeled “clean with solvent only.”

7.6.1 Determine colorfastness to water in accordance with AATCC 107.

7.6.2 This method is a “Guideline” procedure to evaluate color change within the cleaned area under standardized conditions. Although not directly related to consumer cleansing with water-base or solvent-base cleansing agents, it will give reliable information on the fastness of the fabric coloration to water and solvent, which are the principal agents that would cause color migration, bleeding, or any combination thereof. In this context, the color change occurring in these tests denotes any change due to color loss or bleeding and migration of one color to another within the cleaned area.

7.6.3 In the evaluation of the test results, the fabric tested is compared against the original to establish color change.

7.6.4 Those fabrics that are not fast to water or solvent media or both, and show a color change should be so labeled.

#### 7.7 Colorfastness to Solvent:

7.7.1 Determine the colorfastness to solvent in accordance with AATCC 107, with the following modifications:

7.7.2 *Test Solution*—Use technical grade perchloroethylene.

NOTE 8—Perchloroethylene is toxic, and the usual precautions for handling chlorinated solvents should be taken. It should be used only under well ventilated conditions. The solvent is nonflammable.

NOTE 9—The rollers in the wringer used should be such that they will not be affected by the solvent.

7.7.3 After loading the specimens in the Perspiration Tester, Perspirometer, or similar device, allow them to stand for 2 h in the prevailing room atmosphere. Then remove them from the unit and allow them to dry completely while hanging in the prevailing room atmosphere. Do not press or iron the specimens.

7.7.4 See 7.6.2-7.6.4.

7.8 *Colorfastness to Burnt Gas Fumes*—Determine the colorfastness to burnt gas fumes in accordance with AATCC Test Method 23. Do not wash or dryclean these fabric specimens either before or after testing.

7.9 *Colorfastness to Crocking*—Determine the colorfastness to wet and dry crocking in accordance with AATCC Test Method 8 for solid shades and AATCC Test Method 116 for prints, or as agreed between the purchaser and supplier.

7.10 *Colorfastness to Light*—Determine the colorfastness to light as directed in AATCC Method 16.

NOTE 10—There are distinct differences in spectral distribution between the various types of machines listed in AATCC Method 16, with no overall correlations between them. Consequently, these machines cannot be used interchangeably. In case of controversy, results obtained with the Water Cooled Xenon Arc machine listed in Option E shall prevail.

7.11 *Colorfastness to Ozone*—Determine the colorfastness to ozone in accordance with AATCC Test Method 129.

7.12 *Retention of Hand, Character, and Appearance*—A fabric tested in accordance with 7.5, 7.6, and 7.7 shall not change more in hand, character, or appearance than in the limitations set by prior agreement between purchaser and supplier.

NOTE 11—Water tests would not apply, if labeled “Solvent Clean Only.”

7.13 *Durability of Back Coating*—A fabric shall exhibit no cracking or peeling of back coating when tested in accordance with 7.5, 7.6, and 7.7. Durability should be compatible with cleaning code.

7.14 *Flammability*—The flammability requirements shall be as agreed between the purchaser and the seller, provided they meet or exceed those of Part 1610 of the Flammable Fabric Act Regulations.

7.15 *FTC Requirements*—The Federal Trade Commission (FTC) promulgated the Guides for the Household Furniture Industry.<sup>12</sup> Although the Textile Fiber Products Identification Act specifically exempts outer coverings of furniture from the application of the act, the FTC has very specific regulations covered in detail in Guide 5 of the Guides for the Household Furniture Industry. In brief, this rule covers the following:

- 7.15.1 False or deceptive representation as to fiber content,
- 7.15.2 How to identify fibers properly in advertising,
- 7.15.3 How to identify fibers properly on tags or labels,
- 7.15.4 Restrictions concerning representation of fabric tests, and
- 7.15.5 Restrictions concerning representation of performance characteristics of upholstery fabrics.

## 8. Keywords

8.1 abrasion resistance; durability; fabric; flock; performance; specification; upholstery

<sup>12</sup> Promulgated by the FTC on Dec. 21, 1973, to be effective on March 21, 1974.

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