



# Standard Performance 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 performance 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 performance 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>2</sup>
- D 1424 Test Method for Tearing Strength of Fabrics by Falling-Pendulum Type (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 4157 Test Method for Abrasion Resistance of Textile Fabrics (Oscillatory Cylinder Method)<sup>2</sup>
- D 5034 Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test)<sup>3</sup>

### 2.2 AATCC Test Methods:<sup>4</sup>

- 8 AATCC 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>4</sup>
- 129 Colorfastness to Ozone in the Atmosphere Under High Humidities
- Gray Scale for Color Change, Evaluation Procedure 1
- Chromatic Transference Scale, AATCC Evaluation Procedure 8
- AATCC 9-Step Chromatic Transference Scale
- Specifications Standards Test Procedures for Upholstered Furniture Fabrics<sup>5</sup>
- Guides for the Household Furniture Industry<sup>6</sup>

### 2.3 Federal Standard:

- 16CFR, Chapter II-Consumer Product Safety Commission, Subchapter D-Flammable Fabrics Act Regulation<sup>7</sup>

### 2.4 Military Standard:

- ASQ/ANSI Z1.4 Sampling Procedures and Tables for Inspection by Attributes<sup>8</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 performance specification, refer to Terminology D 123. Definitions found in a dictionary of common terms are suitable for terms used in this performance specification.

## 4. Significance and Use

4.1 Fabrics intended for this end-use should meet all of the requirements listed in Table 1.

4.2 It should be recognized that fabrics can be produced utilizing an almost infinite number of combinations of construction variables ( e.g., type of fibers, percentage of fibers,

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

<sup>3</sup> Annual Book of ASTM Standards, Vol 07.02.

<sup>4</sup> AATCC Technical Manual, available from the American Association of Textile Chemists and Colorists, P. O. Box 12215, Research Triangle Park, NC 27709.

<sup>5</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>6</sup> Available from the Bureau of Consumer Protection, Federal Trade Commission, Washington, DC 20580.

<sup>7</sup> Available from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

<sup>8</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                      | 6.1     |
| Tongue tear strength                         | 27 N (6 lbf), min                        | 6.2     |
| Resistance to yarn slippage                  | 111 N (25 lbf), min                      | 6.3     |
| Surface abrasion <sup>A</sup>                |  |         |
| Light-duty                                   | 3000 cycles (double rubs), min           | 6.4     |
| Medium-duty                                  | 9000 cycles (double rubs), min           | 6.4     |
| Heavy-duty                                   | 15,000 cycles (double rubs), min         | 6.4     |
| Dimensional change:                          |  |         |
| Warp or filling                              | 5.0% shrinkage, max to<br>2.0% gain, max | 6.5     |
| Colorfastness to: <sup>B</sup>               |  |         |
| Water, <sup>C</sup> Color Change             | grade 4, <sup>D</sup> min                | 6.6     |
| Solvent, <sup>C</sup> Color Change           | grade 4, <sup>D</sup> min                | 6.7     |
| Burnt gas fumes-2 cycles                     | grade 4, <sup>D</sup> min                | 6.8     |
| Crocking:                                    |  |         |
| Dry  | grade 4, <sup>E</sup> min                | 6.9     |
| Wet  | grade 3, <sup>E</sup> min                | 6.9     |
| Light-40 AATCC Fading Units                  | grade 4, <sup>D</sup> min                | 6.10    |
| Ozone 1 cycle                                | grade 4, <sup>D</sup> min                | 6.11    |
| Retention of hand, character, and appearance | no significant change                    | 6.12    |
| Durability of back coating                   | no significant change                    | 6.13    |
| Flammability                                 | pass                                     | 6.14    |
| FTC Requirements                             | pass                                     | 6.15    |

<sup>A</sup> For guideline purposes see 6.4.1.

<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 6.6.2.

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

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

yarn twist, yarn number, warp and pick count, chemical and mechanical finished). Additionally, fashion or aesthetics dictate that the ultimate consumer may find acceptable articles made from fabrics that do not conform to all of the requirements in Table 1.

4.2.1 Hence, no single performance specification can possibly apply to all the various fabrics that could be utilized for this end-use.

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

## 5. Specification Requirements

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

## 6. Test Methods (See Note 1)

6.1 *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 extension (CRE) tensile testing machine.

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

NOTE 2—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.

### 6.3 Resistance to Yarn Slippage:

6.3.1 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.

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

6.3.3 Use a chrome or nickel plated needle, 0.063 in. (1.60 mm) in diameter.<sup>9</sup>

6.3.4 Use a No. 24-4 hard finish “Z” twist white cotton sewing thread<sup>10</sup> as the needle thread. Use either hard or soft finish No. 24-4 “Z” twist white cotton sewing thread for the bobbin thread.

### 6.4 Surface Abrasion:

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

6.4.2 Use a clean wire screen abradant, stainless steel, 50 by 70 mesh (210 by 297 µm), backed by a 14-mesh (1.4 by 1.4 mm) to an 18-mesh (1.0 by 1.0 mm) screen.

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

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

6.4.5 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 3—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.

<sup>9</sup> Singer No. 23 needle, or its equivalent has been found satisfactory for this method.

<sup>10</sup> Source, most suppliers of upholstery sewing thread.

6.4.6 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.

#### 6.5 Dimensional Change:

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

NOTE 4—Test is not relevant if fabric is to be labeled “clean with solvent only.”

#### 6.5.2 Procedure:

6.5.2.1 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.

6.5.2.2 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.

6.5.2.3 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.

6.5.2.4 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.

6.5.3 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 +.

#### 6.6 Colorfastness to Water:

NOTE 5—Test is not relevant if fabric is to be labeled “clean with solvent only.”

6.6.1 Determine colorfastness to water in accordance with AATCC 107.

6.6.2 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.

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

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

#### 6.7 Colorfastness to Solvent:

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

6.7.2 Test Solution—Use technical grade perchloroethylene.

NOTE 6—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 7—The rollers in the wringer used should be such that they will not be affected by the solvent.

6.7.3 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.

6.7.4 See 6.6.2-6.6.4.

6.8 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.

6.9 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.

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

NOTE 8—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.

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

6.12 Retention of Hand, Character, and Appearance—A fabric tested in accordance with 6.5, 6.6, and 6.7 shall not change more in hand, character, or appearance than in the limitations set by prior agreement between purchaser and supplier.

NOTE 9—Water tests would not apply, if labeled “Solvent Clean Only.”

6.13 Durability of Back Coating—A fabric shall exhibit no cracking or peeling of back coating when tested in accordance with 6.5, 6.6, and 6.7. Durability should be compatible with cleaning code.

6.14 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.

6.15 FTC Requirements—The Federal Trade Commission (FTC) promulgated the Guides for the Household Furniture Industry.<sup>11</sup> Although the Textile Fiber Products Identification Act specifically exempts outer coverings of furniture from the

<sup>11</sup> Promulgated by the FTC on Dec. 21, 1973, to be effective on March 21, 1974.

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:

- 6.15.1 False or deceptive representation as to fiber content,
- 6.15.2 How to identify fibers properly in advertising,
- 6.15.3 How to identify fibers properly on tags or labels,
- 6.15.4 Restrictions concerning representation of fabric tests,

and

6.15.5 Restrictions concerning representation of performance characteristics of upholstery fabrics.

## **7. Keywords**

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

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