



## Standard Performance Specification for Woven Umbrella Fabrics<sup>1</sup>

This standard is issued under the fixed designation D4112; 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 woven fabrics comprised of any textile fiber or mixture of fibers to be used in umbrellas.

1.2 These requirements apply to both the length and width directions for those properties where fabric direction is pertinent.

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:<sup>2</sup>

D123 Terminology Relating to Textiles

D434 Test Method for Resistance to Slippage of Yarns in Woven Fabrics Using a Standard Seam (Withdrawn 2003)<sup>3</sup>

D1284 Test Method for Test for Relaxation and Consolidation Dimensional Changes of Stabilized Knit Wool Fabrics (Withdrawn 1990)<sup>3</sup>

D1336 Test Method for Distortion of Yarn in Woven Fabrics

D1424 Test Method for Tearing Strength of Fabrics by Falling-Pendulum (Elmendorf-Type) Apparatus

D2261 Test Method for Tearing Strength of Fabrics by the Tongue (Single Rip) Procedure (Constant-Rate-of-Extension Tensile Testing Machine)

D2262 Test Method for Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant-Rate-of-Travel Tensile Testing Machine) (Withdrawn 1995)<sup>3</sup>

D5034 Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test)

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

8 Colorfastness to Crocking: AATCC Crockmeter Method

16 Colorfastness to Light

22 Water Repellency: Spray Test

23 Colorfastness to Burnt Gas Fumes

35 Water Resistance: Rain Test

109 Colorfastness to Ozone in the Atmosphere Under Low Humidities

116 Colorfastness to Crocking: Rotary Vertical Crockmeter Method

129 Colorfastness to Ozone in the Atmosphere Under High Humidities

172 Colorfastness to Non-Chlorine Bleach in Home Laundering

188 Colorfastness to Chlorine Bleach in Home Laundering Evaluation Procedure No. 1 Gray Scale for Color Change

Evaluation Procedure No. 2 Gray Scale for Staining

Evaluation Procedure No. 3 AATCC Chromatic Transference Scale

#### 2.3 Federal Standard:<sup>5</sup>

16 CFR, Chapter II—Consumer Product Safety Commission Subchapter D—Flammable Fabrics Act Regulations

#### 2.4 Military Standard:<sup>6</sup>

MIL-STD-105D Sampling Procedures and Tables for Inspection by Attributes

NOTE 1—Reference to test methods in this specification 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 Definitions:

3.1.1 For definitions of textile terms used in this specification refer to the individual ASTM and AATCC methods and to Terminology D123.

<sup>1</sup> This performance specification is under the jurisdiction of ASTM Committee D13 on Textiles and is the direct responsibility of Subcommittee D13.63 on Home Furnishings.

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<sup>2</sup> 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.

<sup>3</sup> The last approved version of this historical standard is referenced on www.astm.org.

<sup>4</sup> Available from American Association of Textile Chemists and Colorists (AATCC), P.O. Box 12215, Research Triangle Park, NC 27709, http://www.aatcc.org.

<sup>5</sup> Available from Superintendent of Documents, Government Printing Office, Washington, DC 20402.

<sup>6</sup> Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

3.2 Definitions found in a dictionary of common terms are suitable for this specification.

#### 4. Specification Requirements

4.1 The properties of woven fabrics for umbrellas shall conform to the specification requirements in [Table 1](#).

#### 5. Significance and Use

5.1 Upon agreement between the purchaser and the supplier, fabrics intended for this end use should meet all of the requirements listed in [Table 1](#) of this specification.

5.2 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 upon agreement between the purchaser and the supplier.

5.2.1 In such cases, any references to the specification shall specify that: "This fabric meets ASTM Specification D4112 except for the following characteristic(s)."

5.3 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 [5.2](#), ultimate consumer demands dictate varying performance parameters for any particular style of fabric.

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

#### 6. Sampling

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

6.2 *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.

#### 7. Test Methods (see [Note 1](#))

7.1 *Breaking Force*—Determine the dry breaking force as directed in Test Method [D5034](#), using a constant rate of traverse (CRT) tensile testing machine with the speed of the pulling clamp at  $300 \pm 10$  mm ( $12 \pm 0.5$  in./min).

[NOTE 2](#)—If preferred, the use of a constant-rate-of-extension (CRE) testing machine is permitted. The crosshead speed should be as agreed upon between the purchaser and the supplier. There may be no overall correlation between the results obtained with the CRT machine and the CRE machine. Consequently, these two breaking-load testers cannot be used interchangeably. In case of controversy, the CRT machine shall prevail.

7.2 *Resistance to Yarn Slippage*—Determine the resistance to yarn slippage as directed in Test Method [D434](#).

[NOTE 3](#)—The precision of Test Method [D434](#) is being established, and it may not be suitable for fabrics with low-yarn counts in terms of ends and picks per inch (see [5.2](#)).

7.3 *Yarn Distortion*—Determine the yarn distortion as directed in Test Method [D1336](#).

7.4 *Tear Strength*—Determine the tear strength as directed in Test Method [D2262](#).

[NOTE 4](#)—If preferred, the use of Test Methods [D1424](#) and [D2261](#) is permitted with existing requirements as given in this specification. There may be no overall correlation between the results obtained with the tongue-tear machines and the Elmendorf machine. Consequently, these tear testers cannot be used interchangeably. In case of controversy, Test Method [D2262](#) shall prevail.

#### 7.5 Colorfastness:

7.5.1 *Gas*—Determine the colorfastness to Burnt Gas Fumes (on the original fabric and after one laundering) as directed in AATCC Method 23 after 1 cycle.

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

[NOTE 5](#)—There are distinct differences in spectral distribution between the various types of machines listed in AATCC Test 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.


**TABLE 1 Specification Requirements**

[NOTE 1](#)—Class for color change and color transfer is based on a numerical scale of 5 for negligible or no color change or color transfer to 1 for severe color change or color transfer.

Characteristic	Requirements	Section
<i>Breaking strength (load) (CRT):</i>		<a href="#">7.1</a>
Dry	154 N (35 lbf), min	
Wet	89 N (20 lbf), min	
<i>Yarn slippage</i>	6-mm (¼-in.) separation at 67 N (15 lbf), min	<a href="#">7.2</a>
<i>Yarn distortion:</i>		<a href="#">7.3</a>
Satin	2.5 mm (0.10 in.), max	
All other	1 mm (0.05 in.), max	
<i>Tongue-tear strength</i>	22 N (5 lbf), min	<a href="#">7.4</a>
<i>Colorfastness:</i>		
Burnt gas fumes—1 cycle:		
Shade change, original fabric	Class 4 <sup>A</sup> , min	<a href="#">7.5.1</a>
Shade change, after laundering	Class 4 <sup>A</sup> , min	
Light (20 AATCC FU) (xenon-arc)	Step 4 <sup>A</sup> , min	<a href="#">7.5.2</a>
Chlorine Bleach	Class 4 <sup>A</sup> , min	<a href="#">7.5.5</a>
Non-Chlorine Bleach	Class 4 <sup>A</sup> , min	<a href="#">7.5.6</a>
Crocking:		<a href="#">7.5.3</a>
Dry	Class 4 <sup>B</sup> , min	
Wet	Class 4 <sup>B</sup> , min	
Ozone—1 cycle	Class 4 <sup>A</sup> , min	<a href="#">7.5.4</a>
<i>Dimensional change</i>	3 %, max	<a href="#">7.6</a>
<i>Water resistance:</i>		<a href="#">7.7</a>
Categories based on minimum time for 1-g weight increase at head pressure of:		
2 ft (600 mm)	30 s, shower	
2 ft (600 mm)	2 minutes, rain	
3 ft (915 mm)	5 minutes, storm	
<i>Water repellency:</i>		<a href="#">7.8</a>
Smooth-textured fabrics:		
Original	90 min	
After laundering	70 min	
Rough-textured fabrics:		
Original	80 min	
After laundering	70 min	
<i>Flammability</i>	pass	<a href="#">7.9</a>

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

<sup>B</sup> AATCC Gray Scale for Staining.

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7.5.3 *Crocking*—Determine the colorfastness to crocking as directed in AATCC Test Method 8 for solid shades and AATCC Test Method 116 for prints, or as agreed upon between the purchaser and the supplier.

7.5.4 *Ozone*—Determine the colorfastness to ozone as directed in AATCC Method 129.

7.5.5 *Colorfastness to Chlorine Bleach*—Determine the colorfastness to chlorine bleach as directed in AATCC Method 188.

7.5.6 *Colorfastness to Non-Chlorine Bleach*—Determine the colorfastness to non-chlorine bleach as directed in AATCC Method 172.

7.6 *Dimensional Change*—Determine the maximum-dimensional change as directed in Sections 10 and 11 of Test Methods **D1284**.

7.7 *Water Resistance (Rain Test)*—Determine the water resistance (rain test) on the original fabric and after laundering as in 7.5 as directed in AATCC Test Method 35.

7.8 *Resistance to Wetting (Spray Test)*—Determine the resistance to wetting (spray test) on the original fabric and after laundering as in 7.5 as directed in AATCC Test Method 22.

7.9 *Flammability*—The flammability requirements shall be as agreed upon between the purchaser and the supplier, except when regulated by applicable Government standards.

## 8. Keywords

8.1 fabric; performance; specification; umbrella

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