



Designation: D 4112 – 02

Standard Performance Specification for Woven Umbrella Fabrics¹

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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:²

- D 123 Terminology Relating to Textiles
- D 434 Test Method for Resistance to Slippage of Yarns in Woven Fabrics Using a Standard Seam
- D 1284 Test Methods for Relaxation and Consolidation Dimensional Changes of Stabilized Knit Wool Fabrics
- D 1336 Test Method for Distortion of Yarn in Woven Fabrics
- D 1424 Test Method for Tear Resistance of Woven Fabrics by Falling-Pendulum (Elmendorf) Apparatus
- D 2261 Test Method for Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant-Rate-of-Extension Tensile Testing Machine)
- D 2262 Test Method for Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant-Rate-of-Traverse Tensile Testing Machine)
- D 5034 Test Method for Breaking Force and Elongation of Textile Fabrics (Grab Test)

2.2 AATCC Test Methods:³

- 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:*⁴
- 16 CFR, Chapter II—Consumer Product Safety Commission Subchapter D—Flammable Fabrics Act Regulations
- 2.4 *Military Standard:*⁵
- 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 D 123.

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.

⁴ Available from Superintendent of Documents, Government Printing Office, Washington, DC 20402.

⁵ Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

¹ This 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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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 Available from American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, NC 27709.

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
Breaking strength (load) (CRT):		7.1
Dry	154 N (35 lbf), min	
Wet	89 N (20 lbf), min	
Yarn slippage	6-mm (¼-in.) separation at 67 N (15 lbf), min	7.2
Yarn distortion:		7.3
Satins	2.5 mm (0.10 in.), max	
All other	1 mm (0.05 in.), max	
Tongue-tear strength	22 N (5 lbf), min	7.4
Colorfastness:		
Burnt gas fumes—1 cycle:		
Shade change, original fabric	Class 4 ^A , min	7.5.1
Shade change, after laundering	Class 4 ^A , min	
Light (20 AATCC FU) (xenon-arc)	Step 4 ^A , min	7.5.2
Chlorine Bleach	Class 4 ^A , min	7.5.5
Non-Chlorine Bleach	Class 4 ^A , min	7.5.6
Crocking:		7.5.3
Dry	Class 4 ^B , min	
Wet	Class 4 ^B , min	
Ozone—1 cycle	Class 4 ^A , min	7.5.4
Dimensional change	3 %, max	7.6
Water resistance:		7.7
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	
Water repellency:		7.8
Smooth-textured fabrics:		
Original	90 min	
After laundering	70 min	
Rough-textured fabrics:		
Original	80 min	
After laundering	70 min	
Flammability	pass	7.9

^A AATCC Gray Scale for Color Change.

^B AATCC Gray Scale for Staining.

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 D 4112 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 D 5034, using a constant rate of traverse (CRT) tensile testing machine with the speed of the pulling clamp at 300 ± 10 mm (12 ± 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 D 434.

NOTE 3—The precision of Test Method D 434 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 D 1336.

7.4 *Tear Strength*—Determine the tear strength as directed in Test Method D 2262.

NOTE 4—If preferred, the use of Test Methods D 1424 and D 2261 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 D 2262 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.

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.