



Standard Performance Specification for 100 % Cotton Denim Fabrics¹

This standard is issued under the fixed designation D 6554; 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 specification covers performance requirements for 100 % cotton woven denim fabrics used in the manufacture of jeans, casual apparel, work clothing, and outerwear.

1.2 This performance specification is not applicable to woven denim fabrics used as interlinings or protective clothing.

1.3 This standard covers the performance of denim fabric on rolls ready for garment manufacturing.

1.4 *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 to determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

- D 123 Terminology Relating to Textiles²
- D 434 Test Method for Resistance to Slippage of Yarn in Woven Fabrics Using a Standard Seam²
- D 1230 Test Method for Flammability of Apparel Textiles²
- D 1424 Test Method for Tearing Strength of Fabrics by Falling-Pendulum Type (Elmendorf) Apparatus²
- D 3107 Test Method for Stretch Properties of Woven Fabrics from Stretch Yarns³
- D 3774 Test Method for Width of Woven Fabric⁴
- D 3776 Test Methods for Mass per Unit Area (Weight) of Woven Fabric⁴
- D 3882 Test Method for Bow and Skewness in Woven and Knitted Fabrics⁴
- D 5034 Test Method for Breaking Force and Elongation of Textile Fabrics (Grab Test)⁴

2.2 AATCC Standards⁵:

- Test Method 8 Colorfastness to Crocking: AATCC Crockmeter Method

- Test Method 16(Option E) Colorfastness to Light: Water-Cooled Xenon-Arc Lamp, Continuous Light
- Test Method 61 Colorfastness to Laundering, Home and Commercial: Accelerated
- Test Method 109 Colorfastness to Ozone in the Atmosphere Under Low Humidities
- Test Method 116 Colorfastness to Crocking: Rotary Vertical Crockmeter Method
- Test Method 135 Dimensional Changes in Automatic Home Laundering of Woven or Knit Fabrics
- Evaluation Procedure 1 Gray Scale for Color Change
- Evaluation Procedure 2 Gray Scale for Staining
- Evaluation Procedure 8 AATCC—9 Step Chromatic Transference Scale

2.3 Federal Standard:

- 16 CFR 16.10, Chapter II, Subchapter D—Flammable Fabrics Act Regulations⁶

2.4 Other Document:

- Glossary of AATCC Standard Terminology⁵

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

3. Terminology

3.1 Definitions:

3.1.1 *denim, n*—a durable woven twill fabric, usually of all cotton or a blend of cotton and manufactured fibers, made from a variety of yarn numbers, and in various fabric weights, colors, designs, and finishes.

3.1.2 *indigo dyed, adj*—a condition of the yarn after being colored with a blue dye from the indigo plant or synthetic process.

3.1.3 *jeans, n*—pants or slacks made from denim fabrics.

3.2 For definitions of other textile terms used in this specification, refer to Terminology D 123 and the Glossary of AATCC Standard Terminology.

3.3 Definitions of Terms Specific to This Standard:

3.3.1 *heavy-weight, adj*—fabric mass (weight) of 466 g/m² (13.75 oz/yd²) or greater.

3.3.2 *light-weight, adj*—fabric mass (weight) of 271 g/m² (8.00 oz/yd²) or less.

¹ This test method is under the jurisdiction of ASTM Committee D13 on Textiles and is direct responsibility of Subcommittee D13.61 on Apparel.

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

³ Discontinued; See 1998 *Annual Book of ASTM Standards*, Vol 07.01.

⁴ *Annual Book of ASTM Standards*, Vol 07.02.

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

⁶ Available from US Government Printing Office, Washington, DC 20402.

3.3.3 *medium-weight, adj*—fabric mass (weight) of 272 g/m²– 465 g/m²(8.01 oz/yd²– 13.74 oz/yd²).

4. Significance and Use

4.1 Upon agreement between purchaser and supplier, 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 apparel made from these fabrics may find the product acceptable, even if it does not conform to all of the requirements in Table 1 or Table 2. One or more of the requirements listed in Table 1 or Table 2, therefore, may be modified upon agreement between the purchaser and the supplier.

4.2.1 In such cases, any references to this specification must specify the following: “This fabric meets ASTM Specification D 6554 except for the following characteristic(s):” All exceptions must be noted.

4.3 Where no prepurchase agreement has been reached between the purchaser and the supplier, and in case of controversy, the requirements listed in Tables 1 and 2 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.

5. Sampling

5.1 *Lot Sample*—As a lot sample for acceptance testing, select at random the number of rolls designated in an applicable specification or other agreement between the purchaser and the supplier.

5.2 *Laboratory Sample*—After removing the outer layer from each roll or piece in the lot sample, cut two laboratory samples spanning the full width of the fabric and at least 1 m (1 yd) in length, along the selvage.

6. Specification Requirement

6.1 The properties of woven denim fabrics conform to Tables 1 and 2 specifications.

7. Test Methods

7.1 *Breaking Strength (Force)*—Determine the dry-breaking strength (force) as directed in the grab test procedure of Test Method D 5034, using the constant-rate-of-traverse (CRT) tensile-testing machine with the speed of the pulling clamp at 300 ± 10 mm (12 ± 0.5 in./min). Constant-rate-of-extension (CRE) tensile testing machinery may be used upon agreement between purchaser and supplier, recognizing that the two tensile testers do not necessarily yield similar results.

7.2 *Tear Strength*—Determine the tear strength as directed in Test Method D 1424.

7.3 *Seam Slippage*—Determine the fabric seam slippage as outlined in Test Method D 434.

7.4 *Skewness*—Determine skewness as directed in Test Method D 3882; bow measurements also may be determined.

7.5 *Warp Elongation*—Determine warp elongation as outlined in Test Method D 3107.

7.6 *Width*—Determine fabric width as outlined in Test Method D 3774.

7.7 *Weight*—Determine fabric weight as outlined in Test Method D 3776.

7.8 *Dimensional Change*—Determine dimensional change as outlined in AATCC Test Method 135. Measurements should be made after three laundry cycles.

7.8.1 The wash conditions and drying procedures shall be as directed in the applicable procedure in AATCC Test Method 135.

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

7.10 Colorfastness to:

7.10.1 *Ozone*—Determine the colorfastness to ozone as directed in AATCC Test Method 109.

7.10.2 *Laundering*—Determine the colorfastness to laundering as directed in AATCC Test Method 61. The test

TABLE 1 Performance Requirements

Characteristics	Requirements			Section
	Heavy Weight	Medium Weight	Light Weight	
Breaking Strength (Force), CRT:				7.1
Warp	801 N (180 lbf), min	578 N (130 lbf), min	356 N (80 lbf), min	
Filling	312 N (70 lbf), min	244 N (55 lbf), min	178 N (40 lbf), min	
Elmendorf Tear Strength:				7.2
Warp	51 N (11.5 lbf), min	35 N (8.0 lbf), min	18 N (4.0 lbf), min	
Filling	18 N (4.0 lbf), min	15 N (3.5 lbf), min	13 N (3.0 lbf), min	
Seam Slippage: (¼-in. Separation)	222 N+ (50 lbf +)	133 N+ (30 lbf +)	111 N+ (25 lbf +)	7.3
Skewness:				7.4
3 × 1 Twill, only		8 % ± 3 %(wtl) ^A		
2 × 1 Twill, only		4.5 ± 3 %(wtl) ^A		
Stretch (Warp Elongation) as agreed upon between purchaser and supplier				7.5
Width as agreed upon between purchaser and supplier				7.6
Weight as agreed upon between purchaser and supplier				7.7
Dimensional Change, %				
Laundering				7.8
Preshrunk (each direction)		4.0 % max,		
Flammability		Class I ^B		7.9

^AWTL = with the twill line.

^BMeets federal regulations for wearing apparel. See 2.3.

TABLE 2 Colorfastness Requirements

	Non-Indigo Dyed	Indigo Dyed and Sulfur Black Colors	Section
Colorfastness:			
Ozone, two cycles, shade change			7.10.1
Original (*A)	Grade 4 min	Grade 3.5 min	
After one laundry cycle (*A)	Grade 4 min	Grade 4 min	
Laundering:			7.10.2
Shade change (*A)	Grade 3.5, min	Grade 2, min	
Stain (*B)	Grade 3, min	Grade 2, min	
Light (*A) (20 AATCC FU)(xenon-arc):	Grade 4, min	Grade 4, min	7.10.3
Crocking (*C):			7.10.4
Dry	Grade 4, min	Grade 3, min	
Wet	Grade 1.5, min	Grade 1.5, min	

Scale

*A—AATCC Gray Scale for Color Change

*B—AATCC Gray Scale for Staining

*C—AATCC Chromatic Transference

NOTE 1—Class for color change or color transfer is based on a numerical scale of 5 for negligible to 1 for severe color change or color transfer. These properties may not be relevant if the denim will be garment wet processed. Other properties may be negotiable between customer and supplier.

conditions shall be as agreed upon between the purchaser and supplier.

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7.10.3 *Light*—Determining the colorfastness to light as directed in AATCC Test Method 16 using Option E.

8. Keywords

7.10.4 *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

8.1 apparel; denim; jeans; pants; specifications

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