



Designation: D 4155 – 95a

# Standard Performance Specification for Women's and Girls' Woven Sportswear, Shorts, Slacks, and Suiting Fabrics<sup>1</sup>

This standard is issued under the fixed designation D 4155; 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 used in women's and girls' sportswear, or suitings.

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

1.3 This performance specification is not applicable to woven fabrics used for interlinings, jeans, and dungarees.

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 determine the applicability of regulatory limitations prior to use.*

## 2. Referenced Documents

### 2.1 ASTM Standards:

- D 123 Terminology Related 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 1424 Test Method for Tear Resistance of Woven Fabrics by Falling Pendulum (Elmendorf) Apparatus<sup>2</sup>
  - D 2261 Test Method for Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant-Rate-of-Extension Tensile Testing Machine)<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 2724 Test Methods for Bonded, Fused, and Laminated Apparel Fabrics<sup>2</sup>
  - D 5034 Test Method for Breaking Force and Elongation of Textile Fabrics (Grab Test)<sup>3</sup>
- ### 2.2 AATCC Test Methods:<sup>4</sup>
- 8 Colorfastness to Crocking—AATCC Crockmeter Method
  - 15 Colorfastness to Perspiration
  - 16 Colorfastness to Light
  - 23 Colorfastness to Burnt Gas Fumes
  - 61 Colorfastness to Washing, Domestic and Laundering, Commercial Accelerated
  - 116 Colorfastness to Crocking; Rotary Vertical, Crockmeter Method
  - 119 Color Change Due to Flat Abrasion (Frosting): Screen Wire Method
  - 124 Appearance of Durable Press Fabrics after Repeated Home Laundering
  - 132 Colorfastness to Dry Cleaning
  - 135 Dimensional Changes in Automatic Home Laundering of Durable Press Woven or Knit Fabrics

- Evaluation Procedure 1 Gray Scale for Color Change
- Evaluation Procedure 2 Gray Scale for Staining
- Evaluation Procedure 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 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 Definitions:

3.1.1 For definitions of textile terms used in this specification, refer to the individual ASTM and AATCC test methods and to Terminology D 123.

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

## 4. Specifications Requirements

4.1 The properties of woven fabrics for women's and girls' sportswear and suitings shall conform to the specification requirements in Table 1.

<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.

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

<sup>5</sup> Available from Superintendent of Documents, Government Printing Office, Washington, DC 20407.

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

**TABLE 1 Specification Requirements**

NOTE 1—Class for colorfastness and durable press (DP) rating is based on a numerical scale of 5 for negligible or no color change, color transfer, or wrinkle to 1 for very severe color change, color transfer, or wrinkle.

Characteristics	Requirements	Section
Breaking strength (load) CRT <sup>A</sup>		7.1
Worsted and cotton count yarns:		
Warp	155 N (35 lbf) min	
Filling	133 N (30 lbf) min	
Woolen run yarns, each direction	111 N (25 lbf) min	
Yarn slippage, 6.3-mm (¼-in.) separation at	89 N (20 lbf) min	7.2
Tongue tear strength	8.9 N (2.0 lbf) min	7.3
Fabric appearance (see 7.4.1.1)	DP 3.5 <sup>B</sup> min	7.4
Colorfastness:		
Burnt gas fumes—1 cycle		7.5.1
Shade change, original fabric	Class 4 <sup>C</sup> min	
Shade change, after one laundering or one drycleaning	Class 4 <sup>C</sup> min	
Laundering:		
Shade change	Class 4 <sup>C</sup> min	7.5.2
Staining	Class 3 <sup>D</sup> min	
Drycleaning:		
Shade change	Class 4 <sup>C</sup> min	7.5.3
Perspiration:		
Shade change	Class 4 <sup>C</sup> min	7.5.4
Staining	Class 3 <sup>D</sup> min	
Light (40 AATCC FU) (xenon-arc) <sup>A</sup>	Step 4 <sup>C</sup> min	7.5.5
Crocking:		
Dry	Class 4 <sup>E</sup> min	7.5.6
Wet	Class 3 <sup>E</sup> min	
Frosting:		
Shade change	Class 4 <sup>C</sup> min	7.5.7
Dimensional change:		7.6
Pressing and finishing	2 % max	7.6.1
Laundering	3 % max	7.6.2
Drycleaning	2 % max	7.6.3
Flammability	pass	7.7

<sup>A</sup> More than one method can be used to measure these properties. These methods cannot be used interchangeably, since there may be no overall correlation between them (see Note 2, Note 4, and Note 6).

<sup>B</sup> For durable press fabrics only.

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

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

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

## 5. Significance and Use

5.1 Upon mutual 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 by mutual 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 4155 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 test methods are discussed in the appropriate sections of the specified test 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  $300 \pm 10$  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 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 will 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 *Tear Strength*—Determine the tear strength as directed

in Test Method D 1424.

**NOTE 4**—If preferred, the use of Test Methods D 2261 and D2262 is permitted with existing requirements as given in this standard. 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 1424 shall prevail.

**7.4 Fabric Appearance**—Determine the fabric appearance as directed in AATCC Test Method 124 after laundering using the wash-and-wear cycle or the normal cycle as agreed between the purchaser and the supplier as specified in 7.6.2 for washable fabrics or after drycleaning as specified in 7.6.3 for drycleanable fabrics (see Note 5).

**7.4.1** For fabrics not intended for use in “durable press” garments determine the fabric smoothness after pressing as specified in Section 10.2.5 of Test Methods D 2724.

**7.4.1.1** The fabric smoothness durable press (DP) rating of such fabrics, and the DP rating of drycleaned fabrics, shall have decreased no more than ½ DP rating from that of the fabric before it is laundered or drycleaned.

**7.5 Colorfastness:**

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

**7.5.2 Laundering**—Determine the colorfastness to laundering as directed in AATCC Test Method 61. The test conditions shall be as agreed between the purchaser and supplier (see Note 5).

**7.5.3 Drycleaning**—Determine the colorfastness to drycleaning as directed in AATCC Test Method 132.

**NOTE 5**—Launderable fabrics are expected to be drycleanable except where all or part of the fabric is not drycleanable and is so labeled. For example, the fabric could contain a functional finish soluble in the solvent, or the fiber could be degraded by the solvent, as would be the case with poly(vinyl chloride) fiber. Goods labeled “drycleanable” are to be drycleaned only.

**7.5.4 Perspiration**—Determine the colorfastness to perspiration as directed in AATCC Test Method 15.

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

**NOTE 6**—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.

**7.5.6 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 between the purchaser and the seller.

**7.5.7 Frosting**—Determine the colorfastness to flat abrasion as directed in AATCC Test Method 119.

**7.6 Dimensional Change:**

**7.6.1 Pressing and Finishing During Manufacturing**—Mark specimen(s) as directed in Section 5.4 of AATCC Test Method 135. Press and finish specimen(s) as agreed upon by the purchaser and the supplier with respect to time cycles, temperature, steam, vacuum, and mechanical pressure of the press head. Measure the specimen(s) and calculate the dimensional change as directed in Sections 6 and 7 of AATCC Test Method 135 (see Note 2).

**7.6.1.1** If no agreement has been made between the purchaser and the supplier, press the specimen(s) using a flat-bed steam press and using a cycle as directed in 10.1.4.1 through 10.1.4.5 of Test Methods D 2724.

**7.6.2 Laundering**—Determine the maximum dimensional change after five launderings as directed in the applicable procedure in AATCC Test Method 135 or as agreed between the purchaser and the supplier (see Note 5 and Note 7).

**7.6.2.1** The wash conditions and drying procedure shall be as specified by the supplier.

**NOTE 7**—Specimens prepared for 7.6.1 may be used for 7.6.2 and 7.6.3 as desired. When this is done, the dimensional change due to laundering or drycleaning is calculated using Eq 1. The dimensional change to pressing is determined on the fabric as it will reach the user. It is not additive to the dimensional change to laundering or drycleaning of the fabric (see 6.1).

$$\text{Percent Dimensional Change} = 100(D_1 - D_2)/D_2 \quad (1)$$

where:

$D_1$  = measurement after laundering or drycleaning, and

$D_2$  = measurement after pressing and finishing.

**7.6.3 Drycleaning**—Determine the maximum dimensional change after three drycleanings as directed in Section 10.1.1 thru 10.1.5 of Test Methods D 2724 or as agreed between the purchaser and the supplier.

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

## 8. Keywords

8.1 fabric; pants; performance; specification; suiting

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