



Designation: D4155 – 22

Standard Performance Specification for Women's and Girls' Woven Sportswear, Shorts, Slacks, and Suiting Fabrics¹

This standard is issued under the fixed designation D4155; 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 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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

D123 Terminology Relating to Textiles

D434 Test Method for Resistance to Slippage of Yarns in Woven Fabrics Using a Standard Seam (Withdrawn 2003)³

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Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant-Rate-of- Traverse Tensile Testing Machine) (Withdrawn 1995)³

D2724 Test Method for Bond Strength of Bonded, Fused, and Laminated Apparel Fabrics

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

2.2 AATCC Test Methods:⁴

TM8 Colorfastness to Crocking—AATCC Crockmeter Method

TM15 Colorfastness to Perspiration

TM16.3 Colorfastness to Light: Xenon-Arc

TM23 Colorfastness to Burnt Gas Fumes

TM61 Colorfastness to Washing, Domestic and Laundering, Commercial Accelerated

TM116 Colorfastness to Crocking; Rotary Vertical, Crockmeter Method

TM119 Color Change Due to Flat Abrasion (Frosting): Screen Wire Method

TM124 Appearance of Durable Press Fabrics after Repeated Home Laundering

TM132 Colorfastness to Dry Cleaning

TM135 Dimensional Changes of Fabrics after Home Laundering

TM172 Colorfastness to Powdered Non-chlorine Bleach in Home Laundering

TM188 Colorfastness to Sodium Hypochlorite Bleach in Home Laundering

EP1 Gray Scale for Color Change

EP2 Gray Scale for Staining

EP8 AATCC 9-Step Chromatic Transference Scale

2.3 Federal Standard:⁵

16 CFR 1610, Chapter II-Consumer Product Safety Commission Subchapter D-Flammable Fabrics Act Regulations

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

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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 The last approved version of this historical standard is referenced on www.astm.org.

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

⁵ Available from U.S. Government Printing Office Superintendent of Documents, 732 N. Capitol St., NW, Mail Stop: SDE, Washington, DC 20401, <http://www.access.gpo.gov>.

2.4 Military Standard:⁶

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 **D123**.

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**.

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

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 D4155 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.

TABLE 1 Specification Requirements

NOTE 1—Grade for colorfastness and smoothness appearance (SA) 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) CRE or CRT ^A		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
Tear strength	8.9 N (2.0 lbf) min	7.3
Fabric smoothness appearance (see 7.4.1.1)	SA 3.5 ^B min	7.4
Colorfastness:		
Burnt gas fumes—1 cycle		7.5.1
Shade change, original fabric	Grade 4 ^C min	
Shade change, after one laundering or one drycleaning	Grade 4 ^C min	
Laundering: ^F		
Shade change	Grade 4 ^C min	7.5.2
Staining	Grade 3 ^D min	
Drycleaning:		
Shade change	Grade 4 ^C min	7.5.3
Perspiration: ^F		
Shade change	Grade 4 ^C min	7.5.4
Staining	Grade 3 ^D min	
Light (40 AFU) (xenon-arc) ^A	Grade 4 ^C min	7.5.5
Crocking: ^F		
Dry	Grade 4 ^E min	7.5.6
Wet	Grade 3 ^E min	
Frosting:		
Shade change	Grade 4 ^C min	7.5.7
Chlorine Bleach	Grade 4 ^C , min	7.5.8
Non-chlorine Bleach	Grade 4 ^C , min	7.5.9
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	Class 1	7.7

^A 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** and **Note 4**).

^B For durable press fabrics only.

^C AATCC Gray Scale for Color Change.

^D AATCC Gray Scale for Staining.

^E 9-Step Chromatic Transference Scale.

^F See **Note 5**.

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 D5034, using a constant rate of extension (CRE) tensile testing machine with the speed of the pulling clamp at 300 mm ± 10 mm (12 in. ± 0.5 in.)/min.

NOTE 2—Historically, the use of a constant-rate-of-traverse (CRT) testing machine was used. 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 D434.

NOTE 3—The precision of Test Method D434 is being established by subcommittee D13.59, 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 D1424.

NOTE 4—If preferred, the use of Test Methods D2261 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 D1424 shall prevail.

7.4 *Fabric Appearance*—Determine the fabric appearance as directed in AATCC TM124 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 6).

7.4.1 For fabrics not intended for use in “durable press” garments determine the fabric smoothness after pressing as specified in Section 10.4.1-10.4.5 of Test Methods D2724 - 07(2015).

7.4.1.1 The fabric smoothness appearance (SA) rating of such fabrics, and the SA rating of drycleaned fabrics, shall have decreased no more than ½ SA 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 TM23 after 1 cycle.

7.5.2 *Laundering*—Determine the colorfastness to laundering as directed in AATCC TM61. The test conditions shall be as agreed between the purchaser and supplier (see Note 6).

NOTE 5—It has been reported that the results for staining, obtained by standard AATCC Test Methods, on fabrics dyed to dark shades that contain a combination of polyester and spandex, or their blends, may not show the full staining propensity of such fabrics in consumer use. It is, therefore, recommended that the staining results obtained by these tests not be used for acceptance testing of such fabrics.

7.5.3 *Drycleaning*—Determine the colorfastness to drycleaning as directed in AATCC TM132.

NOTE 6—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 TM15 (see Note 5).

7.5.5 *Light*—Determine the colorfastness to light as directed in AATCC TM16.3 Option 3.

7.5.6 *Crocking*—Determine the colorfastness to crocking as directed in AATCC TM8 for solid shades and AATCC Test Method 116 for prints, or as agreed between the purchaser and the seller (see Note 5).

7.5.7 *Frosting*—Determine the colorfastness to flat abrasion as directed in AATCC TM119.

7.5.8 *Colorfastness to Sodium Hypochlorite Bleach*—Determine colorfastness to sodium hypochlorite bleach as directed in AATCC TM188.

7.5.9 *Colorfastness to Non-chlorine Bleach*—Determine colorfastness to non-chlorine bleach as directed in AATCC TM172.

ASTM D4155-7.6 Dimensional Change:

7.6.1 *Pressing and Finishing During Manufacturing*—Mark specimen(s) as directed in Section 6 of AATCC TM135. 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 8 and 9 of AATCC TM135 (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 10.4.1 through 10.4.5 of Test Methods.

7.6.2 *Laundering*—Determine the maximum dimensional change after five launderings as directed in the applicable procedure in AATCC TM135 or as agreed between the purchaser and the supplier (see Note 6 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).

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