



# Standard Performance Specification for Men's and Boys' Woven Underwear Fabrics<sup>1</sup>

This standard is issued under the fixed designation D 3820; 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 men's and boys' woven underwear fabrics composed of any textile fiber or mixture of textile fibers.

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

1.3 The following safety hazards caveat pertains only to the test method described in this specification: *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 Relating 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 (ConstantRate-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 2905 Practice for Statements on Number of Specimens for Textiles<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
  - 96 Dimensional Changes in Laundering of Woven and Knitted Textiles Except Wool
  - 116 Colorfastness to Crocking: Rotary Vertical Crockmeter Method
  - 124 Appearance of Durable Press Fabrics After Repeated Home Launderings
  - 135 Dimensional Changes in Automatic Home Laundering of Durable Press Woven or Knit Fabrics
  - 172 Colorfastness to Non-Chlorine Bleach in Home Laundering
  - 188 Colorfastness to Chlorine Bleach in Home Laundering 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:
- 16 CFR 1610 Standard for Flammability of Clothing Textiles<sup>5</sup>
  - 16 CFR, Chapter II—Consumer Product Safety Commission, Subchapter D—Flammable Fabrics Act Regulations<sup>5</sup>
- ### 2.4 Military Standard:
- MIL-STD-105D Sampling Procedures and Tables for Inspection by Attributes<sup>6</sup>

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 Definition:

3.1.1 *underwear, n*—clothing worn next to the skin under outer clothes.

3.2 For definitions of textile terms used in this specification, refer to the individual ASTM and AATCC Test Methods and to Terminology D 123.

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

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

<sup>5</sup> Available from Superintendent of Documents, U.S. 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.

#### 4. Specification Requirements

4.1 The properties of fabrics for men's and boys' woven underwear shall conform to the specification requirements in Table 1.

#### 5. Significance and Use

5.1 Upon mutual agreement between the purchaser and the supplier, woven 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 3820 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 significance and use of particular properties and test methods are discussed in the appropriate sections of the specified test methods.

#### 6. Sampling

6.1 *Acceptance Testing Lot*—Unless there is prior agreement consider as a lot for acceptance testing all material of a

single item received as a single shipment.

6.2 *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.

6.3 *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.

6.4 *Test Specimens*—Take the number of specimens directed in each of the applicable test methods. Perform the tests on the fabric as it will reach the customer. Any “partially finished” or “post-finish” fabrics should be processed in accordance with the fabric manufacturer's instructions.

6.5 If the applicable test method does not specify the number of specimens, use the procedures in Practice D 2905 to determine the number of specimens per laboratory sampling unit. Use (1) a reliable estimate of the variability of individual observations on similar materials in the user's laboratory, (2) a 95 % probability level, and (3) an allowable difference of 5 % of the average between the test results on laboratory sampling units and the average for the laboratory sampling unit. The average for a laboratory sampling unit is the average that would be obtained by applying the test method to all of the potential specimens from that laboratory sampling unit.

#### 7. Test Method (See Note 1)

7.1 *Breaking Force*—Determine the dry breaking force, in the standard atmosphere for testing textiles, 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 and the CRE machines. 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 has not been established, and it may not be suitable for fabrics with low-yarn counts (see 5.2) in terms of ends and picks per inch.

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 or D 2262 is permitted with existing requirements as given in this specification. There may be no overall correlation between the results obtained by the tongue tear method and the Elmendorf method. In case of controversy, Test Method D 1424 shall prevail.

#### 7.4 Dimensional Change:

7.4.1 *Laundering*—Determine the maximum dimensional change after five launderings as directed in the applicable procedure in AATCC Test Method 135.

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

#### 7.5 Colorfastness:

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

**TABLE 1 Specification Requirements**

NOTE 1—Class in colorfastness and DP requirement is based on a numerical scale of 5 for negligible or no color change, color transfer, or fabric wrinkle to 1 for severe color change, color transfer, or fabric wrinkle.

Characteristic	Requirements	Section
Breaking strength (load) (CRT)	111 N (25 lbf), min	7.1
Yarn slippage, ¼-in. (6-mm) separation	67 N (15 lbf), min	7.2
Tear strength	6.7 N (1.5 lbf), min	7.3
Dimensional change after five launderings	3%, max in each direction	7.4.1
Colorfastness:		
Burnt gas fumes—2 cycles:		7.5.1
Shade change, original fabric	Class 4 <sup>A</sup> min	
Shade change after one laundering or one drycleaning	Class 4 <sup>A</sup> min	
Chlorine Bleach	Class 4 <sup>A</sup> min	7.5.6
Non-Chlorine Bleach	Class 4 <sup>A</sup> min	7.5.7
Laundering:		7.5.2
Shade change	Class 4 <sup>A</sup> min	
Staining	Class 3 <sup>B</sup> min	
Crocking:		7.5.3
Dry	Class 4 <sup>C</sup> min	
Wet	Class 3 <sup>C</sup> min	
Perspiration:		7.5.4
Shade change	Class 4 <sup>A</sup> min	
Staining	Class 3 <sup>B</sup> min	
Light (20 AATCC FU) (xenon-arc)	Step 4 <sup>A</sup> min	7.5.5
Fabric Appearance (see 7.6.1.1)	DP 3.0 min	7.6
Flammability	Class 1 or Class 2	7.7

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

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

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

NOTE 5—Washing conditions shall be the same as those used in 7.4.1.1.

7.5.2 *Laundering*—Determine the colorfastness to laundering as directed in the applicable procedure of AATCC Test Method 61. The test conditions shall be as specified by the seller.

7.5.3 *Crocking*—Determine colorfastness to dry and wet 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 supplier.

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

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

7.5.7 *Colorfastness to Non-Chlorine Bleach*—Determine colorfastness to chlorine bleach as directed in AATCC Test Method 172.

7.6 *Fabric Appearance After Repeated Home Launderings*—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 7.4.1.1.

7.6.1 For fabrics not intended for use in “durable press” garments, determine the fabric smoothness after pressing as specified in Section 5.12 of AATCC Test Method 96.

7.6.1.1 The fabric smoothness DP (durable press) rating of such fabrics shall have decreased no more than ½ DP rating from that of the fabric before it is laundered.

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

## 8. Keywords

8.1 fabric; performance; specification; underwear

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