



Designation: ~~D3994~~ – 14 D3994 – 22

## Standard Performance Specification for Woven Swimwear Fabrics<sup>1</sup>

This standard is issued under the fixed designation D3994; 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 for use in men's, women's and children's swimwear, 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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *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:<sup>2</sup>

[D123 Terminology Relating to Textiles](#)

[D434 Test Method for Resistance to Slippage of Yarns in Woven Fabrics Using a Standard Seam](#) (Withdrawn 2003)<sup>3,2</sup>

[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 \(Constant-Rate-of-Extension Tensile Testing Machine\)](#)

[D2622 Test Method for Sulfur in Petroleum Products by Wavelength Dispersive X-ray Fluorescence Spectrometry](#)

[D2905 Practice for Statements on Number of Specimens for Textiles](#) (Withdrawn 2008)<sup>3</sup>

[D5034 Test Method for Breaking Strength and Elongation of Textile Fabrics \(Grab Test\)](#)

[D7022 Terminology Relating to Apparel](#)<sup>3</sup>

#### 2.2 AATCC Test Methods:<sup>4</sup>

[8TM8 Colorfastness to Crocking: Crockmeter Method](#)

[15TM15 Colorfastness to Perspiration](#)

[16.3TM16.3 Colorfastness to Light](#)

[23TM23 Colorfastness to Burnt Gas Fumes](#)

[61TM61 Colorfastness to Laundering: Accelerated](#)

<sup>1</sup> This performance specification is under the jurisdiction of ASTM Committee D13 on Textiles and is the direct responsibility of Subcommittee D13.61 on Apparel. Current edition approved March 15, 2014; Nov. 1, 2022. Published April 2014; November 2022. Originally approved in 1981. Last previous edition approved in 2013 as ~~D3994~~ – 13; ~~D3994~~ – 14. DOI: ~~10.1520/D3994-14~~. 10.1520/D3994-22.

<sup>2</sup> 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.

<sup>3</sup> The last approved version of this historical standard is referenced on www.astm.org.

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

~~106~~[TM106](#) Colorfastness to Water: Sea  
~~107~~[TM107](#) Colorfastness to Water  
~~116~~[TM116](#) Colorfastness to Crocking: Rotary Vertical Crockmeter Method  
~~129~~[TM129](#) Colorfastness to Ozone in the Atmosphere Under High Humidities  
~~135~~[TM135](#) Dimensional Changes of Fabrics After Home Laundering  
~~162~~[TM162](#) Colorfastness to Water: Chlorinated Pool  
~~172~~[TM172](#) Colorfastness to Powdered Non-Chlorine Bleach in Home Laundering  
~~188~~[TM188](#) Colorfastness to Chlorine Bleach in Home Laundering  
~~Evaluation Procedure No. 1~~[EP1](#) Gray Scale for Color Change  
~~Evaluation Procedure No. 2~~[EP2](#) Gray Scale for Staining  
~~Evaluation Procedure No. 8~~[EP8](#) AATCC 9-Step 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 For all terminology related to Apparel see Terminology [D7022](#).

3.1.1 The following terms are relevant to this standard: swimwear.

3.2 For terms relating to chemical or colorfastness testing, refer to specific AATCC methods. For definitions of all other textile terms see Terminology [D123](#).

## 4. Specification Requirements

4.1 The properties of fabrics for woven swimwear 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 D3994, 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.

<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.

**TABLE 1 Specification Requirements**

NOTE 1—Grade in a, b, and c is based on a numerical scale of 5 for negligible or no color change or color transfer to 1 for very severe color change or color transfer.

Characteristic	Requirements	Section
<i>Breaking strength</i> (load) <sup>A</sup> (CRT):		<b>7.1</b>
Nonstretch fabrics	133 N (30 lbf), min	
Stretch fabrics	89 N (20 lbf), min @ 40 % or greater elongation	
<i>Yarn slippage</i> ¼-in. (6-mm) separation	89 N (20 lbf), min	<b>7.2</b>
<i>Tear strength</i> (nonstretch direction)	6.7 N (1.5 lbf), min	<b>7.3</b>
<i>Dimensional change:</i>		
Laundering	3 %, max	<b>7.4.1</b>
<i>Colorfastness:</i>		
Burnt gas fumes—1 cycle		<b>7.5.1</b>
Shade change, original fabric and after 1 laundering	Grade 4 <sup>B</sup> , min	
Sodium Hypochlorite Bleach	Grade 4 <sup>B</sup> , min	<b>7.5.10</b>
Powdered Non-Chlorine Bleach	Grade 4 <sup>B</sup> , min	<b>7.5.11</b>
Laundering <sup>E</sup>		<b>7.5.2</b>
Shade change	Grade 4 <sup>B</sup> , min	
Staining	Grade 4 <sup>C</sup> , min	
Crocking <sup>E</sup>		<b>7.5.3</b>
Dry	Grade 4 <sup>D</sup> , min	
Wet	Grade 4 <sup>D</sup> , min	
Water <sup>E</sup>		<b>7.5.4</b>
Shade change	Grade 4 <sup>B</sup> , min	
Staining	Grade 4 <sup>C</sup> , min	
Chlorinated Pool Perspiration <sup>E</sup>	Grade 4 <sup>B</sup>	<b>7.5.5</b>
Shade change	Grade 4 <sup>B</sup>	<b>7.5.6</b>
Staining	Grade 4 <sup>C</sup>	
Sea water <sup>E</sup>		<b>7.5.7</b>
Shade change	Grade 4 <sup>B</sup> , min	
Staining	Grade 4 <sup>C</sup> , min	
Ozone		
Shade change	Grade 3–4 <sup>B</sup> , min	
Light (20 AATCC FU) (xenon-arc)	Grade 4 <sup>B</sup> , min	<b>7.5.9</b>
Light (20 AFUs) (xenon-arc)	Grade 4 <sup>B</sup> , min	<b>7.5.9</b>
<i>Flammability</i>	Grade 1 or Grade 2	<b>7.6</b>
<i>Flammability</i>	Class 1 or Class 2	<b>7.6</b>

<sup>A</sup> See Note 2.

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

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

<sup>D</sup> AATCC 9-Step Chromatic Transference Scale.

<sup>E</sup> See Note 7.

## 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 seller, 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 D2905 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