Designation: D3996 – 14

Standard Performance Specification for Knit Swimwear Fabrics[1]

This standard is issued under the fixed designation D3996; 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 circular and warp knitted fabrics for use in knit swimwear, composed of any textile fiber or mixture of textile fibers.

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

1.3 The following precautionary statement pertains only to the test methods portion, Section 7, of 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:*[2]

D123 Terminology Relating to Textiles

D2905 Practice for Statements on Number of Specimens for Textiles (Withdrawn 2008)[3]

D3786 Test Method for Bursting Strength of Textile Fabrics—Diaphragm Bursting Strength Tester Method

D3787 Test Method for Bursting Strength of Textiles—Constant-Rate-of-Traverse (CRT) Ball Burst Test

D7022 Terminology Relating to Apparel[3]

2.2 *AATCC Methods:*[4]

8 Colorfastness to Crocking: Crockmeter Method

15 Colorfastness to Perspiration

16.3 Colorfastness to Light

23 Colorfastness to Burnt Gas Fumes

61 Colorfastness to Laundering: Accelerated

106 Colorfastness to Water: Sea

107 Colorfastness to Water

116 Colorfastness to Crocking: Rotary Vertical Crockmeter Method

129 Colorfastness to Ozone in the Atmosphere Under High Humidities

135 Dimensional Changes of Fabrics After Home Laundering

Evaluation Procedure No. 1 Gray Scale for Color Change

Evaluation Procedure No. 2 Gray Scale for Staining

Evaluation Procedure No. 8 AATCC 9-Step Chromatic Transference Scale

162 Colorfastness to Water Chlorinated Pool

172 Colorfastness to Powdered Non-Chlorine Bleach in Home Laundering

188 Colorfastness to Sodium Hypochlorite Bleach in Home Laundering

2.3 *Federal Standard:*[5]

16 CFR 1610 Standard for Flammability of Clothing Textiles

NOTE 1—Reference to test methods in this specification 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 D13.61, Apparel, see Terminology D7022.

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

3.2 For definitions of all other textile terms, see Terminology D123.

3.3 For terms relating to chemical or colorfastness testing, refer to specific AATCC methods.

4. Specification Requirements

4.1 The properties of fabrics for knitted swimwear shall conform to the specification requirements in Table 1.

[1] This performance 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 Superintendent of Documents, Government Printing Office, Washington, DC 20407.

TABLE 1 Specification Requirements

NOTE 1—The grades of colorfastness and SA rating are 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.

Characteristic	Requirements	Section
Bursting strength (ball burst)	30 lbf (133 N), min	7.1
Dimensional change:		
Laundering:		7.2.1
Nonstretch fabrics	5.0 % max in each direction	
Stretch fabrics	7.5 % max in each direction	
Wet relaxation or growth:		
Stretch fabrics	10.0 % max in each direction	
Dry relaxation or growth	5.0 % max in each direction	
Colorfastness:		
Burnt Gas Fumes—1 cycle:		7.3.1
Shade change, original fabric and after 1 laundering	Grade 4 min[A]	
Sodium Hypochlorite Bleach	Grade 4 min[A]	7.3.10
Powdered Non-Chlorine Bleach	Grade 4 min[A]	7.3.11
Laundering:[E]	7.3.2	
Shade change	Grade 4 min[A]	
Staining	Grade 3 min[B]	
Crocking:[E]		7.3.3
Dry	Grade 4 min[C]	
Wet	Grade 3 min[C]	
Water:[E]	7.3.4	
Shade change	Grade 4, min[A]	
Staining	Grade 3 min[B]	
Perspiration:[E]		7.3.5
Shade change	Grade 4 min[A]	
Staining	Grade 3 min[B]	
Chlorinated pool water[D]	...	7.3.6
Sea water:[E]	7.3.7	
Shade change	Grade 4 min[A]	
Staining	Grade 3, min[B]	
Ozone:		7.3.8
Shade change	Grade 3–4 min[A]	
Light (40 AATCC Fading Units) (xenon-arc)	Grade 4 min[A]	7.3.9
Flammability	pass	7.4

[A] AATCC Gray Scale for Color Change.
[B] AATCC Gray Scale for Staining.
[C] AATCC 9-Step Chromatic Transference Scale.
[D] See Note 7.
[E] See Note 6.

5. Significance and Use

5.1 Upon mutual agreement between the purchaser and the seller, 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 seller.

5.2.1 In such cases, any references to the specification shall specify that: "This fabric meets ASTM Specification D3996 except for the following characteristic(s)."

5.3 Where no prepurchase agreement has been reached between the purchaser and the seller, 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 Samples and Laboratory Samples*— For acceptance testing, take lot samples and laboratory samples as directed in each of the applicable test methods.

6.3 *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-finished" fabrics should be processed in accordance with the fabric manufacturer's instructions.

6.4 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 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 Methods

7.1 *Bursting Strength*—Determine the bursting strength, in the standard atmosphere for testing textiles, as directed in Test Method D3787 using an approved type of constant-rate-of-traverse (CRT) machine equipped with a bursting attachment or as directed in Test Method D3786 using an approved type of motor diaphragm-driven bursting tester as agreed upon between the purchaser and the seller.

NOTE 2—Fabrics which include fibers which are known to lose strength when wet, such as rayon, should be tested for wet bursting strength also.

NOTE 3—There is no overall correlation between the results obtained with the CRT machine equipped with a bursting attachment and the diaphragm-bursting tester. Consequently, these two bursting testers cannot be used interchangeably. In case of controversy, Test Method D3786 shall prevail.

NOTE 4—The precision of the burst methods are being established by Subcommittee D13.59. The methods are accordingly not recommended for acceptance testing unless preceded by an interlaboratory check test in the laboratory of the purchaser and the laboratory of the seller using randomized replicate specimens of the material to be evaluated.

7.2 *Dimensional Change:*

7.2.1 *Laundering*—Determine the maximum dimensional change after five launderings as directed in the applicable procedure in AATCC Method 135 or as agreed upon between the purchaser and the seller.

7.2.1.1 The wash conditions and drying procedure shall be as agreed upon between the purchaser and the seller.

7.3 *Colorfastness:*

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

NOTE 5—Washing conditions shall be the same as those used in 7.2.1.1.

7.3.2 *Laundering*—Determine the colorfastness to laundering as directed in the applicable procedure of AATCC Method 61. The test conditions shall be as agreed upon between the purchaser and the seller.

NOTE 6—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.

7.3.3 *Colorfastness to Crocking*—Determine the colorfastness to dry and wet crocking as directed in AATCC Method 8 for solid color fabrics or AATCC Method 116 for printed fabrics or as agreed upon between the purchaser and the seller (see Note 6).

7.3.4 *Colorfastness to Water*—Determine the colorfastness to water as directed in AATCC Method 107 (see Note 6).

7.3.5 *Colorfastness to Perspiration*— Determine the colorfastness to perspiration as directed in AATCC Method 15 (see Note 6).

7.3.6 *Colorfastness to Water-Chlorinated Pool*—Determine colorfastness as directed in AATCC Method 162.

NOTE 7—The development of a standard method for colorfastness to chlorinated swimming pool water has been referred to Committee RA23 of AATCC.

7.3.7 *Colorfastness to Sea Water*—Determine the colorfastness to sea water as directed in AATCC Method 106 (see Note 6).

7.3.8 *Ozone*—Determine the colorfastness to ozone as directed in AATCC Method 129.

7.3.9 *Colorfastness to Light*—Determine the colorfastness to light as directed in AATCC Method 16.3.

NOTE 8—There are distinct differences in spectral distribution between the various types of machines listed in AATCC 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 E3 shall prevail.

7.3.10 *Colorfastness to Sodium Hypochlorite Bleach*—Determine the colorfastness to sodium hypochlorite bleach as directed in AATCC Method 188.

7.3.11 *Colorfastness to Powdered Non-Chlorine Bleach*—Determine the colorfastness to non-chlorine bleach as directed in AATCC Method 172.

7.4 *Flammability*—The flammability requirements shall be as agreed upon between the purchaser and the seller, provided they meet or exceed those of the applicable Government mandatory standard. (See 2.3.)

8. Keywords

8.1 swimwear